

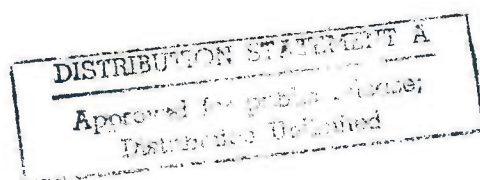
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**PROCEEDINGS OF THE  
DOD/JOINT SERVICES  
PRODUCTION READINESS REVIEWS  
CONFERENCE**



**19 - 20 NOVEMBER 1980**

**WRIGHT-PATTERSON AIR FORCE BASE  
DAYTON, OHIO**

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DOD/JOINT SERVICES  
PRODUCTION READINESS REVIEWS  
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OFFICE OF THE UNDER SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301

RESEARCH AND  
ENGINEERING

DoD/JOINT SERVICES  
PRODUCTION READINESS REVIEW CONFERENCE

Introduction

This document is the official proceedings of the DoD/Joint Services Production Readiness Review (PRR) Conference held at Wright Patterson AFB, Ohio, on 19 and 20 November 1980. The conference convened DoD personnel from the three Military Departments and the Defense Logistics Agency who have or will shortly participate in PRR's. The purposes of the conference were to exchange "lessons learned" and to explore ways to make PRR's more cost beneficial and more contributory to the DoD materiel acquisition process. Subsequent production management conferences are planned to address other key production functions.

Among the areas identified for greater emphasis in future PRR activity were: (1) production cost reduction; (2) determining software readiness; (3) use of Government plant activity personnel; and (4) development of quantitative measurements of production readiness.

These proceedings include speaker presentation material and narratives, a list of attendees, and the major observations and continuing actions synthesized from the discussion periods held throughout the conference.

It is strongly urged that all attendees give attention to the request for data needed to continue the work of the Defense Product Engineering Services Office on PRR quantitative measurements and respond appropriately. This request is contained on page 295 in the proceedings.

The assistance of the Air Force organizational elements and personnel who hosted and administered this conference is gratefully acknowledged.

TRUXTUN R. BALDWIN  
Staff Asst. for Production Management  
Office of Deputy Under Secretary of  
Defense (Acquisition Policy)  
Directorate of Major Systems Acquisition

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## KEYNOTE SPEECH

Truxtun R. Baldwin  
Staff Asst. for Production Management  
Office of the Deputy Under Secretary of Defense (Acquisition Policy)  
Directorate of Major Systems Acquisition

Good morning. This is the DoD Joint Services Production Readiness Review Conference. Our purpose here today is to share our experiences or "lessons learned" in conducting PRRs with the objectives of first improving the PRR process itself, making it more cost beneficial, and secondly, making the PRR contribute more to our conduct of the production phase and a better acquisition process overall.

I would like to get three points across in starting the conference. One, I would like to recognize the contribution that all of us who are engaged in the production function are making here to the Defense effort. I am not talking just about the impact of the PRR on the decision process itself, but the entire production function; the impact it has on the acquisition process as a whole. We are well aware that producing a system for inventory is the ultimate goal of the acquisition process. As far as money is concerned, the production phase amounts to approximately half of the Defense budget and is about three times what is spent in R&D. Time wise, the successful program is in production much longer than it is in development. Considering time and dollars and objectives the production phase is where the rubber meets the road.

The current administration had as one of its objectives elevating the production phase at the OSD staff level when they put the production function under the R&D program directors. This made a kind of continuum in responsibility of developing the system and transitioning it into production. I see that the Services and their staff reorganizations have done much the same thing. What the new administration will do we can only guess; but I believe the emphasis will remain on production certainly and in producing those systems we have been developing during the 70's and getting them fielded in the 80's.

Note we have revised our two top-level system acquisition documents; DoDD 5000.1 and DoDI 5000.2. A casual look through them will find a very heavy emphasis on how to manage the production phase.

We in the production community have our own Defense Directive 5000.34 which sets forth the policy, assigns responsibilities and specifies what will be presented to the DSARC and considered at each program milestone; not just production ones, but each phase along the way. As specified the three Services have developed focal points to help administer the production phase of programs.

Our subject today the PRR, is the culmination of our involvement in this acquisition process and caps our participation throughout the development phase. We have a Defense Instruction 5000.38 on production readiness reviews. It provides a checklist and kind of a uniform concept or approach to conducting the PRR. As you know PRRs are required in support of all production milestone decisions; both limited and full production. As I was talking to one gentleman here just awhile ago, it really provides a rallying point and is an authoritative measure to get us involved early in the program, early in the development stage.

Just a word about the mechanics of the OSD level involvement in PRRs. Drawing upon the Service conducted PRRs our DPESO's organization writes an independent production readiness assessment (PRA) which is submitted to the OSD R&E Program Director prior to the DSARC. This same letter report is given to the Defense Acquisition Executive, Dr. Perry, who is the DSARC chairman. The letter report goes in the blue book which is presented to each of the DSARC principals. This PRA report, as we call it, weighs each critical issue which impacts the decision from a production standpoint. It is analogous to the CAIG cost and the T&E test and evaluation reports which are also special DSARC reports. So you see the production status is presented for consideration on a more or less equal footing with the test and the costing parts of the decision making process. We've had in Mr. Church, who has recently left as our Deputy Under Secretary, a strong voice in bringing our concerns and issues to the DSARC process. He hasn't been hesitant in voicing our position. The highlights of production readiness assessments are reflected in the Secretary of Defense Decision Memoranda, which come out following the DSARC.

Production matters are becoming increasingly involved in other key acquisition decisions and determinations. For example, OSD conducted a recent F-18 program review for the SEC DEF, wherein our office and DPESO played an important part on two of the panels. In addition to updating the production readiness area, we provided technical opinion on producibility problems which the aircraft was having with its landing gear and displays and on a composite bonding problem. We also participated in the cost panel on that review. This latter input is quite important because one of the themes I'd like to get across to you is that we want to be more involved in cost aspects. Our input to that panel was to identify critical areas and suppliers where the cost of the program was of high risk.

At the OSD level, we examine periodically various industrial base problems and get involved in the acquisition strategy of programs particularly in establishing or maintaining competition during the production phase. DPESO has made a number of surveys on alternate sourcing various major components of systems.

The second point I'd like to get across is this urgency of paying more attention to the cost factor when we run our PRRs. You are all aware of the very large procurement bow waves which we have where the annual funding requirements and backlog of previous years' requirements which we did not fund, far exceed the amount of money which we can expect to get in each annual procurement appropriation. One Defense Science Board report said that the requirements each year were a third larger than the amount of money. Another DSB report said that we'd have to reduce the unit cost of equipment forty percent to be able to buy everything we need. If we look at the prospects of getting more money each year, historically we find that the trend in defense spending has been remarkably level. In conducting PRRs and everything else we do we should try to help bring this fiscal affordability problem under control. Affordability has been often described as our most pressing defense problem, manifesting itself in deferrals and stretch-outs and the resulting cycle of lower quantities and higher unit costs. During a PRR we should determine where the design is not stable, where we can expect production changes and retrofit costs, look for areas where MM&T is lacking which would give us lower yields. Look for facilities that are behind schedule and where we're going to have costly work around. One area that PESO is concentrating on now, is identifying these higher cost critical suppliers, contractors who have had overruns during development or prototype production difficulties and may try to recover their costs in production.

The PRR criteria, called guidelines in the back of DoDI 5000.38, do require an examination of the contractors' cost projections, and the justifications for it. In conducting the PRR we need to assure ourselves that these cost projections have been

made and be sure the data is available. When we do this, we can expect some static from the cost communities. They may consider this an encroachment on their cost estimating tasks. The counter to that is we're not trying to make estimates of cost but are looking for areas where the projections of cost estimates may be weak because of problems in capacity and producibility. We served this function in the F-18 program review that I just mentioned. The cost people at OSD, in fact, solicited our help in this cost aspect.

Let me quote from DoDD 5000.2, on the subject of production planning. "From the early phases of the program consideration should be given to the costs of production, including total government investment required to insure adequate production facilities, availability of critical materials and capability. Affordability (there's that 13-letter word again) must be considered in production planning. The program manager shall also consider means to increase the possibilities for competition during production." If we look at DoDD 5000.34, we see that the contractors' plans for cost reduction during production are to be reviewed at DSARC, Milestone III. I believe we need to emphasize this area more. We need to insure ourselves that the contractors do have adequate and active cost reduction programs.

We mentioned competition. We've got to pave the way for initiating or maintaining competition during production. This is a matter of public law, in addition to DoD policy. We need to eliminate or flag the adverse cost impacts of program disruptions, such as stretch-outs. These really kill us on cost as you well know. Jack Bemis is one of our morning speakers. He's done some pioneer work in experience curves in trying to quantify the change in unit production cost as a function of rate.

Lastly, let me give you a few questions or issues which I believe are germane to our conference. As we proceed, let's look for ways that we can get ourselves involved earlier in the acquisition cycle. This morning we will be looking at the cost of running PRRs and we should ask ourselves if we're spending the right amount of money. Is everything that we're doing really cost effective, including the items of contractor cost? How do we make PRR preparations smoother for the contractor so that we're not a burden and we work jointly on identifying and solving these production problems? We'll be talking a little bit later, about improving the credibility of our PRR findings by better quantifying the results. And finally, if we find ways to improve the PRR process how should we go about changing our policy and disseminating new guidance to the DoD components.

Let me now provide a little guidance and instruction on how we're organized to run the conference. We have a very crowded schedule. We wanted to give time to each individual who wanted to address the conference, and we managed to accommodate everyone. At the same time we wanted to have ample periods for discussion. We have a little over three hours for open discussion for everybody to sound off. Also, we left time to summarize the results and identify any continuing actions we want to carry on after the meeting.

To help me in the administration, we have appointed a panel member from each of the three Services and from DPESO. It will be the panel's function to monitor the proceedings and identify key points. I've asked them to organize the presentation of the speakers from their particular activity and to introduce these speakers. I've also asked them to help me with the summary comments and the wrap-up.

Let me introduce them now. First I'd like to introduce Bob Bidwell, who is the Director of DPESO. Representing DPESO on the panel is Bill Jeffers, who is the Chief of the Production Engineering Division. Fred Michel is the Acting Chief of the Office of

Manufacturing Technology, DARCOM. Bill Oaks, the Manager of the Navy PESO, NAVMAT. Cal Ditrick, is Chief of the Manufacturing Engineering Division of Air Force Systems Command.

As far as instructions to the presenters are concerned, I ask you to really hit the key points and please stay within the twenty minutes that you're allotted. Conferees as a whole please participate. I will have to ask you to hold your questions and comments until we have had a series of presentations. Then we'll have a question and answer period.

## DPESO PERSPECTIVE OF PRRs

W.W. Jeffers  
Chief, Product Engineering Division  
DoD Product Engineering Services Office

Three years ago, the issuance of DoD Directive 5000.34, "Defense Production Management," formalized Department-wide attention toward minimizing the risks associated with transitioning defense systems from development into production. In this document, specific production management responsibilities were assigned. Most of you attending this conference have been deeply involved in fulfilling the Military Departments' responsibilities for conducting formal Production Readiness Reviews (PRRs). Among the production management responsibilities of the Under Secretary of Defense for Research and Engineering is the exercise of policy and operational control of the DoD Product Engineering Services Office (DPESO) in the conduct of its mission which includes:

- Providing production management assistance to DoD components.
- Providing independent assessments of producibility and production readiness of major programs.

In this portion of today's program, I will share with you some of the views that our office has regarding various aspects of PRRs. These views are derived from our observations and experiences in the course of accomplishing the mission elements I just cited.

It was originally intended that my remarks be followed by Mr. Gary Dillard's presentation of the results of a recent study he made to determine the costs and benefits of PRRs. Gary recently accepted a position outside of our organization and commitments there prevented his attendance here. Fortunately, the findings from Gary's study serve very nicely to clarify the rationale behind many of the DPESO views of PRRs. As a consequence of these circumstances, I am going to incorporate most of the elements of this presentation into mine. Gary has concurred in this approach. The full text of his paper will be included in the conference proceedings.

Incidentally, the findings of the PRR Cost and Benefits study were derived from interviews with 14 major program offices and members of the Production Engineering Division staff at a major command.

### ● Objective of PRR

- DoD Instruction 5000.38 states: "The objective of a PRR is to verify that the production design, planning and associated preparations for a system have progressed to the point where a production commitment can be made without incurring unacceptable risks of breaching thresholds of schedule, performance, cost, or other established criteria."

- In addition to "verify," could include "help assure."
- Not be used to usurp established lines of program management authority of either the government or the contractor.
- Overall goal - problem-free transition into production.

- Benefits of PRR
  - Stimulates in-depth probing
  - Provides early warning
  - Worth the effort
- Contractual Coverage for PRR Support
  - Essential to insure that there is legal basis for expenditure of contractor effort for PRR support
  - Customarily addressed in SOW
  - Be specific - avoid generalities
    - Minimizes subsequent conflicts of understanding
    - Minimizes contractors' "risk" pricing
  - Require flow down to major/critical subcontractors
  - Appropriate for major/critical GFE contracts
  - Cost of contractor support
    - Consists of (1) manhour cost of preparing for and participating in PRR, (2) cost of reproducing data, (3) travel expenses of prime contractor's PRR visits to subcontractors
    - Has ranged from .02 percent to .12 percent of program development cost (.05 percent average)
    - Ratio of contractor's time for preparation and participation to government PRR onsite time has ranged from two or five to one
    - Length of a single PRR visit usually two to five days
- Planning
  - Initiate review effort early in FSED
    - Early identification of concerns facilitates timely attention to effective resolutions
    - Reduces subsequent PRR workload
  - Incremental reviews
    - Avoids pitfalls of a single snapshot
    - Properly staffed and managed, can permit more effective utilization of limited personnel resources
    - Base number and duration of PRR visits on perceptions of need developed in collaboration with PMO, PRR team manager, and contractor(s)
    - Number and duration of visits governed by complexity of program, contractor's demonstrated responsiveness to PRRs, and observed status of production readiness
    - Maximize cost effectiveness of PRR by scheduling visits in logical geographic sequence
  - Team staffing
    - Independence (freedom from parochial interests) necessary for objectivity (especially true for design status team leader)

- Strive to balance unique program experience (PMO membership) with objectivity and special expertise (outside membership)
- Tailor selection of expertise to meet needs
- Avoid overloading with people
  - Size of team directly influences contractor manpower loading and cost (Ratio of 1.5-2 contractor to 1 government is typical. Government teams have range from 4-5 to 40-60)
  - The larger the team, the more disruptive to contractor's other efforts on program
  - Two people often sufficient to cover each category of the review
  - Excessive duration and membership of PRRs for other programs have caused contractors to be less responsive on subsequent PRRs
- Continuity of team membership desirable
  - "Corporate memory"
  - Uniformity of approach and consistency of evaluation
  - Established rapport with contractor and fellow team members
- Resident CAS representation particularly desirable
- Shortage of experienced PRR personnel
- Expanding availability of appropriate PRR team personnel possible through:
  - Exchange loan of PMO personnel to other program PRRs
  - Creation of roving cadre at command level
  - Utilization of independent consultants
- Orientation
  - Familiarization of team members (by PMO, CAS, PRR manager, etc.)
    - Program under review (including history)
    - PRR schedule, modus operandi, objectives, etc.
    - Principal issues/concerns and past problems
    - Availability of relevant data, reports, studies, and track records of contractors
    - Respective responsibilities of each principal contractor
    - Development and dissemination of industry outlines (questions) relevant to contractors to be visited which expand the topic areas given in DoD Instruction 5000.38 guidelines
    - Native culture, traditions, and policies if PRR visit is foreign-based
  - Familiarization of contractor(s) (by PRR manager, PMO, CAS, etc.)
    - Objectives, schedule, modus operandi
    - PRR team composition
    - Clarification of scope and depth of areas to be reviewed as well as probable extent of validating evidence required
    - Provide inquiry outlines
    - Caliber of contractor personnel desired for interface with PRR team
- On-Site Procedures
  - Full gathering of all PRR participants (government and contractor) at onset of each visit to:

- Reiterate PRR objectives
- Introduce participants and their areas of PRR responsibility
- Describe modus operandi
- Receive contractor's overview statement of program status, chief concerns, and efforts remaining (in-house and with subcontractors)
- Daily meeting of all government participants to:
  - Summarize findings in each sub team's topic area
  - Describe problems encountered
  - Cross feed data acquired or investigative leads outside area of primary responsibility
- Philosophy of inquiry
  - Use inquiry outlines (questions) in open-ended fashion - to lead into and stimulate a greater depth inquiry
  - DoD Instruction 5000.38 guidelines are basically statements of conditions which represent a satisfactory production readiness posture
  - PRR seeks factual evidence from which objective conclusions of status can be developed
  - "Burden of proof" rests principally with contractor(s)
  - Status is only as conclusive as the evidence which portrays it
  - Intent should be to collect, not generate, relevant data purely for benefit of PRR
  - Refrain from requiring non-contractual data to be in a specific format (PRR team can assemble raw data into usable form)
  - Utilize relevant reports and studies rather than making new roads to the same destinations
  - Recognize that performance records on past and other ongoing production efforts are rich sources of relevant data
- Do no risk compromising objectivity of PRR by intermixing other program business with the PRR effort
- Out-briefing with contractor highly desirable
- Areas of Investigation Frequently Underemphasized
  - Stability of design
    - Unsettled design signals probability of retrofit activity, disruptions in production, schedule slippages, cost growth, etc.
    - Overall history of design change rates more meaningful than recent segment of history
    - Design stability remains questionable pending acceptable test results
  - Production cost
    - Cost now ranks as principal issue at production decision point for most programs
    - Substantiate that creditability of current design-to-cost projections have been established
    - Ascertain the extent of emphasis placed on applying cost limiting techniques and the effectiveness of these applications

- Long lead materials and components
  - Verify lead time assumptions for long lead items
  - Verify that procurement planning for long lead items will satisfy demands of production schedule
  - Verify that Defense Priority Rating flows down to lower tier suppliers
- Computer software
  - Just as critical as system hardware
  - Seldom attracts as much notice as the hardware
  - Most software readiness considerations are similar to those for hardware, i.e. compatibility between scheduled events and production requirements, stability and level of change activity, acceptability of configuration documentation and management
  - Unique readiness considerations include: acceptability of language utilized, extent that reserve memory capacity and computational time can accommodate future growth
- Control procedures and practices
  - Documented policy statements and procedures only show "what"
  - PRRs also need to determine "how well" through spot check of procedural compliance and assessments of effectiveness of applications

In closing, I want to stress that the PRR process must be sufficiently flexible to permit effective application in various circumstances. With this in mind, it is my earnest hope that the views I have shared with you will serve to draw out additional views, ideas, and discussions in the course of this conference.



**STUDY OF THE BENEFITS AND COSTS OF  
PRODUCTION READINESS REVIEWS**

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# STUDY OF THE BENEFITS AND COSTS OF PRODUCTION READINESS REVIEWS

## Executive Summary

At the request of the Office of the Under Secretary of Defense for Research and Engineering, the DoD Product Engineering Services Office (DPESO) surveyed a sample of program management offices (PMOs) to determine the cost of contractor support for their Production Readiness Reviews (PRRs) and the Program Managers' (PMs) impressions on the value of having PRRs. DPESO found that the cost of contractor support for those PRRs was a very modest percentage of the program's development cost. Of the programs sampled, the PRR cost ranged from \$54.3K to \$858K; the average cost was \$321.7K. The ratio of contractor cost for PRR support to development cost was less than one percent and ranged from .02 percent to .12 percent with an average of .05 percent. Generally, the PMOs sampled are in favor of PRRs and believe the benefits they received were worth the cost. Two disadvantages of the PRR were cited, but there was no general consensus regarding disadvantages.

From the comments received during the interviews, additional guidance for the conduct of PRRs was developed. The study findings and recommendations are as follows:

### FINDINGS

### RECOMMENDATIONS

1. DoDI 5000.38 lacks PRR criteria in the areas of software and safety.

1. Guidance (contained in text) should be included in future PRRs, and should be included in next revision of DoDI 5000.38.

2. PMOs conducting foreign PRRs have problems not encountered on domestic PRRs.

2.a Requirements for PRR should be included in statement of work (SOW) to prime and flowed down to subcontractors.

2.b. Team members should be well versed in the traditions and culture of the foreign participants.

3. Independence of the design status team leader is important for an objective PRR.

3. A team leader for the design status should not be from the developing office.

4. Personnel experienced in PRRs are difficult to obtain for PRR teams.

4. The PMO should take every opportunity (such as using another program's PRR) to train personnel.

5. The correct team member mix of PMO personnel and "outsiders" is not the same for every program.

5. The PM must tradeoff the program experience and expertise of PMO personnel with the objectivity and lack of program involvement of personnel from outside the PMO.

6. Large PRR teams and lengthy visits are drains on the contractor's resources.
7. Most programs cannot conduct a PRR with single visits to the prime contractor and major subcontractors.
8. Some PMOs are having difficulty getting the contractor's full cooperation on PRRs when there is no requirement for PRRs in the contract.

6. The PM should tradeoff the cost of conducting the PRR with the effectiveness of the team.

7.a. Incremental PRRs should be used by the PM.

7.b. The number of visits should be based on the nature of the program, the contractor's prior experience with PRRs and the government's prior experience with the contractor(s).

8. Every program that is going to have PRRs should have a requirement for the PRR in the contract.

## STUDY OF THE BENEFITS AND COSTS OF PRODUCTION READINESS REVIEWS

### I. Introduction and Purpose

The Office of the Under Secretary of Defense for Research and Engineering (Acquisition Policy) asked the DoD Product Engineering Services Office (DPESO) to conduct a study to determine (1) the cost of contractor support for a PRR and (2) program managers' (PMs) impressions on the benefits, disadvantages, and overall value of the Production Readiness Review (PRR). As a result of the interviews conducted for this study, several recommendations for improving future PRRs were developed.

Section III of this report contains the detailed findings for each of the following topics:

- o Cost of contractors support for a PRR
- o PMO's impressions of the PRR
- o PRR policy guidance
- o Availability of PRR team personnel
- o Qualifications of PRR team personnel
- o Team size
- o Length of PRR visits
- o Number of PRR visits
- o Contract clauses for PRR support

Section IV presents the recommendations developed from these findings (attachment I is a summary of the study findings and recommendations).

### II. Methodology

Sample programs were chosen based on an estimate of the availability of required data. Interviewed for this study were the PMO staffs for the F-16, F-18, EF-111, and AV-8B Aircraft; Precision Location Strike System (PLSS); C-5 Wing Modification; XM-1 Tank; Infantry Fighting Vehicle; Copperhead Guided Projectile; Black Hawk and Advanced Attack Helicopters; PATRIOT, HARM, and Cruise Missiles. Members of the Production Engineering Division staff at the Army Missile Command (MICOM), Redstone Arsenal, were also interviewed. Only Government personnel were interviewed; no contractor personnel were contacted.

Each PMO was asked to provide an estimate developed within the PMO, of the incremental cost of contractor support for a PRR. This estimate was not to include the

other usual costs to prepare for production (i.e., the cost that would normally occur if there were no PRR). The remainder of the information was gathered by conducting interviews with senior PMO staff personnel familiar with the PRR for their program.

### III. Study Findings

#### A. Cost of Contractor Support for the PRR

1. To determine the cost incurred, each PMO estimated the incremental cost to the contractor for supporting the PRR. In all cases, the PMOs said the incremental cost was the sum of: (1) the manhour cost for preparing and conducting the review, (2) reproduction cost of data furnished to the PRR team, and (3) travel cost of prime contractor personnel traveling to subcontractor PRRs, if any. The incremental cost for the sample programs ranged from \$54.3K to \$858K (Table 1) with an average cost of \$321.7K.

TABLE 1  
RANGE OF COST ESTIMATES AND PERCENTAGES  
FOUND IN SAMPLE PROGRAMS

PROGRAM	PRR COST AS A PERCENTAGE OF DEVELOPMENT COST	PRR COST ESTIMATE	SIGNIFICANCE
A	.02%	\$390K	LOWEST PERCENTAGE
B	-	\$54.3K	LOWEST PRR COST
C	.12%	\$782.6K	HIGHEST PERCENTAGE
D	.04%	\$858K	HIGHEST PRR COST
	.05%	-	AVERAGE PERCENTAGE
	-	\$321.7K	AVERAGE COST

2. The PRR cost was found to be a very modest proportion of the development cost. The collected data was used to estimate the ratio of PRR cost to program development cost. This ratio was small, ranging from .0002 to .0012 for the weapon systems sampled with an average of .0005. The ratio of contractor cost to development cost appears to be the most useful guide to use in estimating the magnitude of the contractor's cost of a PRR because preparation for production is a part of the development activity.

3. The small sample size precludes establishing a valid statistical correlation between the cost of contractor support of a PRR and program cost.

## B. PMO's Impressions of the PRR

1. Those interviewed generally favored PRRs. Some said they would not go into production without one. Everyone interviewed believes the PRRs are worth the investment of time and effort. One PMO that did not have a PRR commented that a PRR might have helped the PMO and contractor improve their production planning and eliminate later problems.

2. All the PMO personnel interviewed said the PRR helps avoid later cost and schedule problems by identifying them early in the production planning phases of full-scale development. Some said the PRR encourages the PMO to thoroughly examine elements of the production plan that might otherwise have been overlooked. As a result of one PRR, the affected contractor wrote a production plan for the first time. The PRR frequently benefits other programs as well; the contractor's corrective actions are often implemented plant wide.

3. The PRRs at foreign subcontractor plants benefited the PMO and contractors in other ways. The PRR teams provided consultant service and aided technology transfer by identifying deficiencies in the subcontractor production plan. The PRR also highlighted the differences in business practices between domestic and foreign defense contractors.

4. Most of those interviewed cited the advantages above; few could cite any disadvantages. Two disadvantages mentioned (each comment was made by two PMOs) were:

a. Contractors did not always cooperate fully with the PRR teams. Lack of cooperation was based on contractor complaints that previous PRR visits on other programs were too lengthy and had too many PRR team members.

b. PRR objectives changed. Individuals from higher commands were using the PRR to direct the PM's and contractor's management of the program, rather than as a management tool to assess program production status.

## C. PRR Policy Guidance

1. The majority of those interviewed said the DoD Policy Instruction (DoDI 5000.38, "Production Readiness Reviews") is adequate and they had no suggestions for improvement. Others suggested improved coverage for: (1) software, (2) foreign PRRs, (3) safety, and (4) selection of the group leader for the program design status review team.

a. It was found that PRR criteria in the area of software had been developed for use on a few PRRs. Staff members in DPESO refined these criteria for this paper (see section IV) as guidance for the PMOs.

b. Lessons learned by two programs provided the basis for guidance in the area of foreign PRRs. Those experienced with PRRs at foreign contractor's facilities, found differences in culture or language which compounded the problems usually encountered on domestic PRRs (even English-speaking countries have different technical jargon and approaches). The form of government, Ministry of Defense structure, industry/government relationship, and labor/management relationship, are a

few of the differences that must be addressed during planning and execution of the PRR. It was found that flowing down the requirement for a PRR from the prime contractor to major subcontractors is especially critical when foreign subcontractors are used or contemplated.

c. The criteria and guidance on safety and the design status review group leader in section IV were developed through interviews with PMO and DPESO personnel.

2. All of those interviewed felt there is sufficient implementing guidance for PRRs. Of the three Military Departments, the Air Force has the most guidance in this area with an Air Force Systems Command (AFSC) Guide for Manufacturing Reviews (84-4), an AFSC Regulation on PRRs (84-2), and AFSC Manual (84-3) on Production Management. The Army has issued Army Regulation Number 70-67 (Dec 79) on PRRs. The Navy has recently (Apr 80) issued Secretary of Navy Instruction (SECNAVINST) 4801.1A.

#### D. Availability of PRR Team Personnel

Almost all those interviewed said civilian and military personnel experienced in PRRs were difficult to find. There are few experienced military production personnel. Military officers who are transferred out of production oriented billets are not likely to return. This rotation reduces the corporate memory. The problem of finding appropriate civilian personnel may lesser as more programs have PRRs and more people become familiar with the PRR procedures. However, the problem of obtaining adequately trained military personnel remains acute and is not expected to improve in the foreseeable future.

#### E. Qualifications of PRR Team Personnel

There was a substantial difference of opinion among the people interviewed regarding the qualifications for personnel being assigned to a PRR team. Some PMs preferred program experience as a requirement for team membership. Others preferred people from outside the PMO. The PMs recognized that the independence of team members is very important. Most preferred a mix of PMO personnel and "outsiders." The precise mix of program people and "outsiders" depended upon the complexity of the program and the personnel available to the PM.

#### F. Team Size

The PMOs' preference for the size of the team to be sent to the contractor varied greatly also. Some said that large teams (40-60 members) and lengthy visits by previous PRR teams from other programs made the contractors reluctant to support visits for subsequent PRRs on later programs. Many PMs seemed to prefer small teams (4-5 people). Others stated that a large team was necessary to explore all aspects of the contractor's PRR production plan.

#### G. Length of PRR Visits

Some of those interviewed said lengthy visits were as formidable a problem as large teams; both were drains of the contractor's resources.

#### H. Number of PRR Visits

Most of those interviewed believe incremental reviews are preferable to a single visit. Incremental reviews are more costly but no one interviewed felt a team of reasonable size could assess the contractor's production readiness in just one visit. One PMO commented the incremental reviews built up more confidence than a single visit could and that the contractor's production planning was proceeding on schedule.

#### I. Contract Clauses for PRR Support

In the programs sampled for this survey, Air Force contracts usually included detailed PRR support requirements in the statement of work (SOW) while the Navy included PRR support requirement in contracts less often. Some of those interviewed believe everything the PMO expects in the way of contractor PRR support has to be included in the contract (SOW). Others believe the PRR is just another design or management review that the contractor must support anyway; therefore, PRR support requirements are not needed in the contract. The experience of the PMOs interviewed indicates that whether or not the PRR requirements should be included in the contract is dependent upon the relationship between the PMO and the contractor. Some contractors provided support willingly without any need for including PRR support in the SOW; others would only do what was included in the SOW and funded.

### IV. Conclusions and Recommendations

#### A. PRR Policy Guidance

The cost data gathered indicates that the cost of contractor support of a PRR is a small (in relation to the total development cost) and a worthwhile investment. Those interviewed had stated they believed that the PRR was necessary and beneficial, and that the benefits outweigh the cost of the PRR. Program managers organizing a PRR for their program should take advantage of the lessons learned by others, especially in the areas discussed below.

1. The PM should include the following criteria in his program PRR guidelines. In addition, the next revisions to PRR policy documents (such as DoDI 5000.38) should include criteria for:

##### a. Embedded Computer Software

(1) Plans for programming, debugging, testing, and integrating the software with the hardware are compatible with the production delivery schedule.

(2) Programming, debugging, testing, and integration of software with hardware is progressing according to approved plans.

(3) Software change activity has stabilized at a low level.

(4) Software documentation and support facilities are adequate for maintenance.

(5) A High Order Language, approved in DoD Instruction 5000.31, has been used or a waiver has been granted.

(6) Appropriate use of standard computer hardware has been planned.

(7) There is an adequate configuration management system for the modification of software during production.

(8) There is adequate reserve computer memory and computational time to accommodate reasonable future growth.

(9) Final acceptance procedures for hardware and software have been identified.

b. Safety

(1) System safety requirements are in conformance with accepted standards.

(2) Plant layout and the production plan are in conformance with DoD and the applicable Military Department safety requirements.

2. Each PM organizing a PRR effort should consider the following:

a. Design Status Review Group Leader

The PM should choose an individual as the team leader for the design status review who is independent of the developing office. Choosing an independent design status team leader provides a "fresh" look at the design. The importance of the independence of team members is discussed elsewhere but it is felt that the independence in the design status review group is especially important.

b. Foreign PRRs

(1) Team members should be well versed in the countries' traditions and culture (perhaps through State Department indoctrination). This would lessen the possibility of conflict and misunderstandings thereby increasing the team's efficiency.

(2) PMs should require contractor and major subcontractor support for the PRR. Mil-Std 1528 (Production Management) should be considered because it requires that the prime contractor impose PRR responsibilities on subcontractors if the procuring activity advises that a PRR is to be accomplished at the prime. Contract requirements for PRRs (either by a SOW requirement or by invoking Mil-Std 1528) are especially important when there are foreign subcontractors.

B. PRR Objectives

Each PRR Government team member should be aware of the objective of a PRR; the objective is to assess the risks of proceeding into production. The PRR team has no authority to direct the PM or contractor. The PRR team analyzes, evaluates, and advises but does not direct.

### C. Availability of PRR Team Personnel

One way to ease the shortage of experienced personnel is to provide on-the-job training by supplying key civilian and military personnel (such as group leaders) from the PMO to other programs' PRRs. A second possible solution is to create a cadre of experienced people in the command to provide assistance to the PMOs. Another way to obtain experienced people is to have experienced consultants such as retired production people.

### D. Qualifications of PRR Team Members

The composition of the team must be tailored to the program. The PMO must trade off the program experience and expertise of PMO personnel with the independence, objectivity, and lack of involvement of outsiders. A complex program may require a greater percentage of PMO people than a simple one. Another consideration is the amount of time personnel will spend away from their normal duties to support the PRR. The PMO staff can be made available to the PRR more easily. Sometimes, however, specialized knowledge is only available from outside the PMO.

### E. Team Size

The PM must tailor the size of the PRR teams according to the characteristics of his program. During this study it became apparent that the cost of contractor support was directly influenced by the size of the Government team. The data collected indicated the ratio of the number of contractor personnel to Government personnel involved in the PRRs sampled ranged from 1.5 to 2.0 contractor people per Government team member. This emphasizes the importance of the PM evaluating the cost of conducting the PRR versus the effectiveness of the team. However, if possible the PMO should have at least two people review each technical area (quality, design, facilities, etc.) in order to reduce biases and increase the probability the deficiencies will be identified. For smaller teams this may require each team to cover more than one area.

### F. Length of PRR Visits

For the programs sampled, the ratio of contractor's time (preparing for and participating in the review) to actual Government review time ranged from 2.0 to 5.4. For this reason tailoring the duration of PRR visits is important.

### G. Number of PRR Visits

The number of visits to each contractor should be based upon the nature of the weapon system, the contractor's previous experience with PRRs, the Government's prior experience with a particular contractor's products, and the observed status of production readiness.

### H. Contract Clauses for PRR Support

Including PRR support requirements in the contract SOW appears to be the more prudent strategy to reduce the possibility of uncooperative attitudes by contractors. Attachment 2 gives examples of contract SOWs for PRRs. The amount of detail that the sampled programs included varied greatly. However, the PMO cannot be sure of receiving adequate support if it is not required by the SOW. Therefore, include in the SOW all of the details necessary for contractor support at the PRR.

## SUMMARY OF STUDY FINDINGS AND RECOMMENDATIONS

### FINDINGS

1. DoDI 5000.38 lacks PRR criteria in the areas of software and safety.
2. PMOs conducting foreign PRRs have problems not encountered on domestic PRRs.
3. Independence of the design status team leader is important for an objective PRR.
4. Personnel experienced in PRRs are difficult to obtain for PRR teams.
5. The correct team member mix of PMO personnel and "outsiders" is not the same for every program.
6. Large PRR teams and lengthy visits are drains on the contractor's resources.
7. Most programs cannot conduct a PRR with single visits to the prime contractor and major subcontractors.
8. Some PMOs are having difficulty getting the contractor's full cooperation on PRRs when there is no requirement for PRRs in the contract.

### RECOMMENDATIONS

1. Guidance (contained in text) should be included in future PRRs, and should be included in next revision of DoDI 5000.38.
- 2.a. Requirements for PRR should be included in SOW to prime and flowed down to subcontractors.
- 2.b. Team members should be well versed in traditions and culture of the foreign participants.
3. A team leader for the design status should not be from the developing office.
4. The PMO should take every opportunity (such as using another program's PRR) to train personnel.
5. The PM must trade off the program experience and expertise of PMO personnel with the objectivity and lack of involvement of personnel from outside the PMO.
6. The PM should trade off the cost of conducting the PRR with the effectiveness of the team.
- 7.a. Incremental PRRs should be used by the PM.
- 7.b. The number of visits should be based on the nature of the program, the contractor's prior experience with PRRs, and the Government's experience with the contractor.
8. Every program that is going to have PRRs should have a requirement for the PRR in the contract.

## EXAMPLE NO. 1

G10620.05.04 Production Readiness Reviews The Contractor shall support four incremental Production Readiness Reviews (PRRs). The PRRs will be approximately five days duration occurring in the time frame of this contract. The government will conduct the reviews in sufficient depth and detail to determine the Contractors status of production readiness and that known or anticipated manufacturing problems and high risk areas have been identified and an impact assessment provided. The basic subject involved in the PRRs include the following: Program and Manufacturing Schedules, Make-or-Buy Plan, Material/Subcontracting, Quality Assurance, Industrial Facilities, Tooling, and Special Test Equipment, Manpower, Manufacturing Methods/Producibility, Manufacturing Management and Control System. The team sizes will be tailored as is necessary to support the required review scope and depth (TBD). Particular review emphasis shall depend upon: areas of concern identified during the initial PRRs; progress in production planning tasks; manufacturing progress made by the Contractor in performance of development and production long lead tasks; plans and progress toward transitioning from development to initial low rate production, and plans for achieving the programmed production rate. AFSCR 84-2, "Production Readiness Review," will be used as a guide for preparing for the support of the government PRRs. The PMO will work jointly with the Contractor's PRR focal point/manager to tailor the requirements of AFSCR 84-2 to meet the needs of the Program. The Contractor shall be responsible for conducting additional PRRs at selected subcontractors'/vendors' plants that are mutually agreed to by both government and Contractor. The government will participate as observers with the Contractor during these reviews. The Contractor shall provide personnel and plant facilities necessary to support the scheduled reviews. Contractor personnel who are knowledgeable of the management and detail of the production functions and tasks will be made available to work with government personnel throughout the period of each review (DI-E-3118/M).

## EXAMPLE NO. 2

### 9.18 PRODUCTION READINESS REVIEW (PRR)

- 9.18.1 The Contractor shall plan, coordinate, and participate in a PRR to demonstrate production readiness prior to start of the production phase of the program. The areas to be evaluated in the PRR include the following:
- o Program and Manufacturing Schedules
  - o Subcontract Management
  - o Make or Buy Program
  - o Material Selection and Procurement
  - o Quality Assurance
  - o Industrial Facilities
  - o Tooling
  - o Special Test Equipment
  - o Manpower
  - o Manufacturing Methods/Producibility
  - o Manufacturing Management and Control System
- 9.18.2 The Contractor shall plan for a PRR to be conducted by an Air Force Team at the Contractor's facility. The PRR shall be accomplished in approximately eight days.
- 9.18.3 The Contractor shall conduct one PRR at (subcontractor's) plant to determine the production readiness of the subcontractor. The areas to be evaluated will be the same as those covered in the Contractor's PRR and shall be accomplished in approximately three days.

### EXAMPLE NO. 3

#### 12.2.16 Production Management

The contractor shall plan for, establish, implement, and control production objectives and requirements throughout this program in accordance with MIL-STD-1528. Detailed planning for production shall commence as firm designs are established. The contractor shall identify, plan for, and document production and tooling test and demonstration requirements generating from feasibility assessments and producibility analyses. All production requirements that require operations not previously used in the manufacturing facility shall be identified and plans to introduce new operations in the manufacturing facility shall be afforded the Systems Program Office. The contractor shall provide the necessary personnel and facilities for, and participate in, a SPO-conducted Production Readiness Review (PRR) as set forth in AFSCR 84-2. Approximately six preliminary/incremental PRRs will be conducted at the prime contractor and/or major subcontractor facilities. The final PRR will determine whether: (1) the system under development is ready for efficient and economical production, (2) all critical production engineering problems encountered during development have been resolved, and (3) the contractor has accomplished adequate planning for the production phase. The reviews will be of sufficient depth and detail to adequately determine the contractor's status of production readiness, that known or anticipated manufacturing problems and high risk areas have been identified, and an impact assessment provided. Production readiness will be evaluated against specific criteria established by the Air Force. The criteria set forth in AFSCR 84-2 shall be considered to be a representative sample. DI-P-3460

## BASELINE INDICATORS OF PRODUCTION READINESS

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### ABSTRACT

This paper presents findings resulting from a preliminary study of the feasibility of establishing quantifiable baseline indicators for production readiness of defense systems prior to the production decision milestone. Eleven production readiness indicators are discussed and the characteristics of each, based on empirical data from previous systems, are examined.

Preliminary findings of this study indicate that various elements of production readiness can be measured. Additionally, it has been determined that while each system is unique, there exists a number of common characteristics which can be compared on a system-by-system basis. The following list of baseline indicators was established:

#### HARDWARE INDICATORS

1. Engineering Change Traffic Profiles
2. Reliability Growth Patterns
3. Yield Rates for Special Manufacturing Processes
4. Yield Rates for Test Operations
5. Scrap and Rework Levels
6. Level of Effort on Nonconforming Materials
7. Out-of-Station Work Performed

#### SOFTWARE INDICATORS

1. Rate of Discovery of Errors
2. Rate of Change of Requirements
3. Rate of Change of Revision Level
4. Percent Memory and Speed Capacity Uncommitted

Projected profiles for the behavior of these indicators during the development phase of programs are shown, and the implication of each indicator is discussed.

### INTRODUCTION

Evaluating the production readiness of a weapon system prior to the production decision point is an important element of the DoD weapon system acquisition process. Production readiness is assessed by means of a Production Readiness Review (PRR). Department of Defense Instruction 5000.38, titled "Production Readiness Reviews," defines the purpose of a PRR as follows: "The objective of a PRR is to verify that the production design, planning, and associated preparations for a system have progressed to the point where a production commitment can be made without incurring unacceptable risks of breaching thresholds of schedule, performance,

cost, or other established criteria." The criteria used to establish production readiness has consisted of a series of largely subjective judgments, with guidance provided by checklists. The Product Engineering Services Office undertook a study to establish meaningful and measurable indicators of production readiness based on data that is normally required as part of defense contracts. This paper discusses the preliminary findings of the study, which established a list of eleven potential indicators and examined methods for quantifying them. In selecting the indicators, the following factors were considered:

1. It was recognized that each system was made up of a number of factors which made a particular system unique from any other system in terms of its problems, time scales, state-of-the-art applications, budget restraints, and the necessity for changes during development.
2. Data for the individual indicators should be available either in the Program Office or at the contractor's facility as a result of normally imposed contractual requirements. No requirements for new data items were contemplated.
3. The indicators should be simple in concept and readily understood.
4. Since numerical values for the indicators are variable in time, trend data was considered to be of more value than point data.

Based on these considerations, the following potential baseline indicators were examined:

#### HARDWARE INDICATORS

1. Engineering Change Traffic
2. Reliability Growth Patterns
3. Yield Rates for Special Manufacturing Processes
4. Yield Rates for Test Operations
5. Scrap and Rework Levels
6. Level of Effort on Nonconforming Materials
7. Out-of-Station Work Performed.

#### SOFTWARE INDICATORS

1. Rate of Discovery of Errors
2. Rate of Change of Requirements
3. Rate of Change of Revision Level
4. % Memory and Speed Capacity Uncommitted

Following is a discussion of each indicator, its potential program implications, and a projected

profile of the indicator for the development phase of a program.

#### DISCUSSION

**Engineering Change Traffic Profiles.** Examination of the profile of engineering change traffic can be revealing in terms of the design maturity of a system, as well as providing symptoms of specific problems in the areas of fabrication, inspection and test operations, subcontracted equipment, or in system specifications. When the number of engineering change made is plotted against a time scale which includes the development cycle, a pattern such as that shown in figure 1 will normally occur.

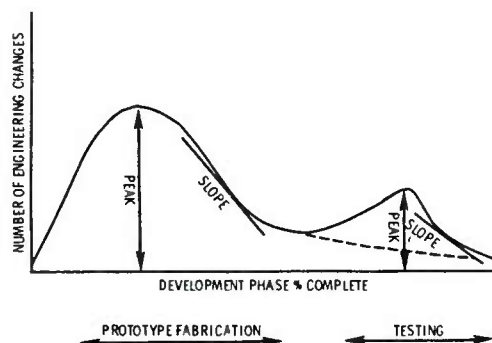


FIGURE 1. PROJECTED PROFILE FOR ENGINEERING CHANGE TRAFFIC

The number of changes starts at a zero point prior to the engineering release. As hardware fabrication is initiated, the number of changes increases to a maximum and should decline as engineering problems are resolved. At the completion of the prototype build, the number of changes should have followed a downward trend to a reasonable level. During prototype testing an increase in changes is noticed due to problems detected during the tests. The curve depicting the number of changes versus time should, again, follow a downward trend to a reasonable level. Sustained levels of high change rate indicate a risk to cost, schedule, and/or performance. The appearance of an apparent excessive number of changes at the completion of the prototype build should raise questions as to cause. It is obvious that both cost and schedule constraints would be extremely difficult to meet with an extended period of high change rate. Empirical data compiled during this study indicated that the shape of the engineering change traffic profile was of a similar shape for different kinds of systems including aircraft, electronic systems, tracked vehicles, and gun systems. The profile is sufficiently defined such that anomalies can be identified and investigated. The cause and effect relationship between engineering changes and acquisition cost growth is well understood, but remains to be quantified. This quantification will be investigated during Phase II of the study.

**Reliability Growth Patterns.** A considerable amount of data has been developed relative to reliability growth which results from finding and fixing reliability problems during testing. When this growth is plotted to linear scales the resulting curve

appears as an exponential. Large gains in reliability are made initially as the "easy to fix" problems are corrected. As the reliability increases, gains in reliability become more difficult to obtain. The result is that the demonstrated reliability approaches a limit on an asymptotic basis. When this data is transformed to a log/log format, the reliability growth curve becomes a straight line, which provides a convenient method for projecting probable future values for reliability. The horizontal axis represents the evaluation exposure in terms of hours tested, miles driven, rounds fired, or other testing criteria suitable to the system. The vertical axis represents the reliability measure in terms of mean time between failures, mean miles between failure, success rate, etc. Experience with a number of projects has allowed the derivation of a generalized set of criteria for these curves during the development phase of a program. Figure 2 depicts the projected profile for reliability growth and indicates the following guidelines when considering reliability growth during the development phase:

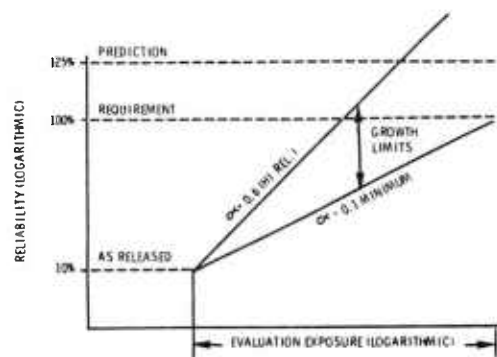


FIGURE 2. PROJECTED PROFILE FOR RELIABILITY GROWTH

1. As released, at least 10 percent of the required reliability should be realized during first tests.
2. A reliability prediction based on a mathematical model of the system would preferably indicate a reliability of 125 percent of the required reliability.
3. The growth curve should have a slope of at least 0.1 and is unlikely to exceed a slope of 0.6.
4. Lack of promising reliability test results during development testing or lack of definite pattern of reliability growth during subsequent testing can be caused by a number of factors including marginal design, parts or materials problems, and ineffective corrective action. The inability to meet reliability requirements during development represent a risk to both acquisition cost and schedule. Inability to meet reliability requirements in a fielded system can have a major impact on operating and support costs. The trend of the reliability growth pattern for a system provides valuable insights into production readiness.

**Yield Rates for Special Manufacturing Processes.** A significant problem in meeting cost and schedule can result from low yield rates for special manufacturing processes. Also, it would be unusual to find a new weapon system in which one or more "state-of-the-art" manufacturing processes was not employed. Under the sponsorship of contractor R&D programs, and under the sponsorship of the DoD Manufacturing Technology Program, a significant number of special processes are under development at any given time. This constant development is necessary in order to reduce costs, increase performance, increase productivity, and to advance the technology base. Examples of these special processes in the electronics field include methods for producing large scale integration (LSI) devices, multi-layer printed circuit boards, and high density memory devices. Examples of these processes in the mechanical area include the laser machining and joining, inertia welding, electro-chemical and electrical discharge machining, vacuum plasma coating, and advanced methods for non-destructive testing.

Low yield rates for any of the special processes would have adverse effects on program cost and/or schedule and, therefore, could represent a program risk. The projected profile for special process yield rates is shown in figure 3. As a new process

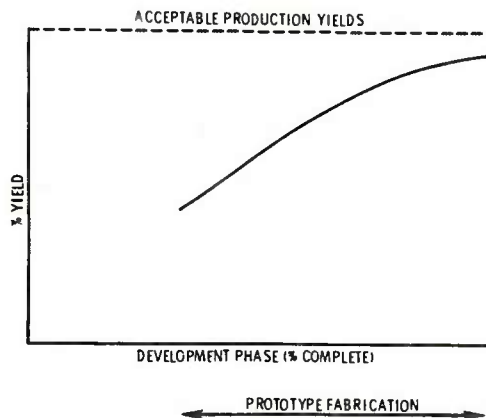


FIGURE 3. PROJECTED PROFILE FOR TEST/PROCESS YIELDS

is developed, the initial yield rates will be lower than the ultimate yield rates as the process variables are being defined and controlled. Normally, the major process variables are controlled first, leading to significant gains in yield rates. In the later stages of development, the "fine tuning" of the process takes place. The "fine tuning" generally leads to smaller gains and yield. Because of this, the process yield approaches an ultimate yield value asymptotically.

A plot of process yield rate versus time should have the following characteristics:

1. A significant growth should be evident in the yield rate as a function of time or units processed.

2. The yield rate attained during the latest period should be acceptable in terms of dollar risk. It is difficult to place limits on the yield rate from a special process since the economic consequences represent a wide variation from one process to another. Restated, the cost of a reject from one process may represent a few cents while a reject from another process may represent thousands of dollars.

It is anticipated that the yield rates for special processes will lend themselves to a transform into a straight line. Data is being collected to indicate what "normal" yield rate values may be expected from these special processes.

**Yield Rates for Test Operations.** Examining the yield rates for test operations and the trends in these rates can be helpful in the identification of a number of different kinds of problems. Low yield rates can result from marginal designs/specifications, or difficulties with parts, materials, or processes. Since both acquisition cost and schedule are sensitive to the yield rates for test operations, it is important that these rates attain satisfactory levels. Figure 3 depicts the projected profile for growth in yield rates for test operations. Sustained period of low yield rates without evidence of improvement would indicate the presence of chronic problems which either have not or cannot be solved through the management systems responsible for corrective action. As in the case of yield rates for special processes, it is anticipated that yield rates for test operations will lend themselves to a suitable data transform such that straight line projections of yield rates can be made.

**Scrap and Rework Levels.** Excessive scrap and rework can add significantly to acquisition cost and be detrimental to schedule. If a contractor's corrective action system is working effectively, experience has shown that the rates for scrap and rework should be decreasing as a function of time and production of additional units. The most appropriate model for the behavior of scrap and rework rates appears to be the standard learning curve. Figure 4 is the projected profile for these curves in situations where effective corrective action is taking place.

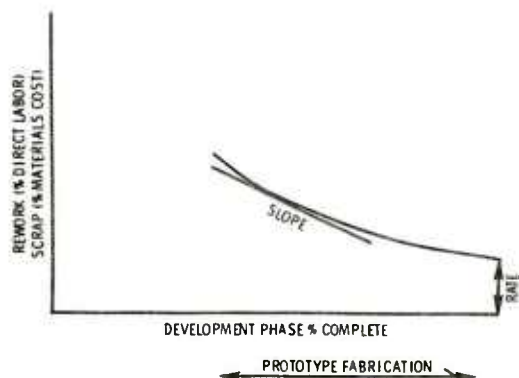


FIGURE 4. PROJECTED PROFILE FOR SCRAP/REWORK

Attributes of these curves should be an acceptable improvement slope as well as a reasonable absolute value at the completion of the development models. Since scrap and rework can be accounted for by several different methods, care should be taken to assure that the same denominator is used in each percentage being compared. For example, common methods of calculating rework value are as a percentage of direct production labor and as a percentage of rework dollars to product dollars.

Excessive scrap and/or rework can serve as a symptom of a wide variety of problems in both the design and manufacturing areas. Lack of improvement in scrap and rework values is an indicator of deficiencies in the management systems responsible for corrective action.

**Nonconforming Materials.** Since there are a large number of causes for nonconforming material, and they are all indicative of problems, the level of effort being expended in the area of nonconforming material can provide valuable insight into the overall health of a program. Additionally, observing the trend of nonconforming material indicators can provide insight into the effectiveness of the management systems that are designed to prevent nonconformances and to provide corrective action. Some of the methods used for tracking non-conforming materials include the following.

1. Plotting the gross number of nonconforming material reports written against successive end items.
2. Calculating the labor dollars involved in making disposition of nonconforming materials through the material review process.
3. Calculating reject rates as percentages.

It appears that regardless of the specific method used for tracking nonconformances, a decreasing trend should occur as shown in figure 4. Steady progress in lowering the nonconformance rate and a reasonable level for the latest result should be evident. The collection of data from additional programs may reveal that the slope of this line could be used as a measure of the effectiveness of a contractor's corrective action system.

**Out-of-Station Work Performed.** This indicator is primarily oriented toward large systems where the development models are assembled on a production line as opposed to being assembled in an engineering laboratory (e.g. aircraft). There are a number of reasons for performing production work out-of-station, and essentially all of them are indicative of problems. These causes include late delivery from subcontractors, tooling problems, design problems, shortage of skilled labor in specific categories, etc. As shown in figure 5, the percentage or absolute measurement of out-of-station work would be expected to increase after the initiation of assembly work. After reaching a peak value, the rate should start to decrease as prototype units are being completed and problem areas are being corrected. Continued high levels of out-of-station work would indicate that the problems causing the out-of-station work are not being solved. Such a continuation of high rates for out-of-station work would represent a risk to the program in terms of

acquisition cost and/or schedule slip. Ideally, the completion of the prototype units would see out-of-station work at a reasonable rate after having followed a downward curve from previously higher levels.

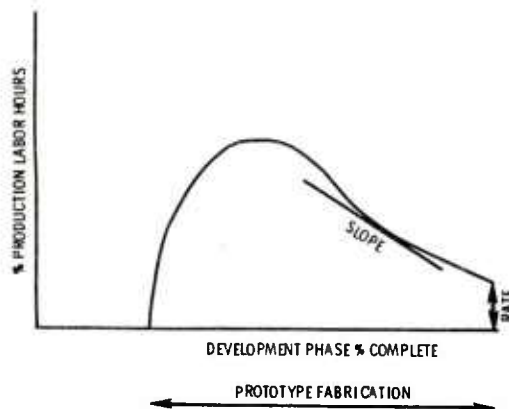


FIGURE 5. PROJECTED PROFILE FOR OUT OF STATION WORK

**Baseline Software Indicators.** The number of DoD procurements involving computer software is rising and this trend is expected to continue. Studies on this subject have indicated that by 1980, software will account for approximately 80 percent of the computer related dollars, with hardware accounting for the other 20 percent. The adequacy of the software is vital to the performance of the weapon system. In recent years considerable effort has been expended in developing metrics for determining the condition of software development programs. Some of these metrics have proved to be highly complex, and in some cases impractical. Only recently have practical and readily understandable measures of software development begun to appear. Underscoring the importance of determining the condition of the software development effort is the fact that this effort is essentially completed prior to the production release for hardware.

For the purpose of this report, four measures of software readiness are suggested:

- Rate of Discovery of Errors
- Rate of Change of Requirements
- Rate of Change of Revision Level
- Percentage of Memory and Speed Capacity Uncommitted

From experience on a number of software development programs, the rate of discovery of errors appears to follow a predictable pattern. Starting with coding checks and proceeding into each successive test phase, the rate of discovery of errors starts out at a relatively high level and follows a downward slope as problems are corrected. Starting with system integration testing, the initial peak rate for error discovery decreases. These relationships are shown in figure 6.

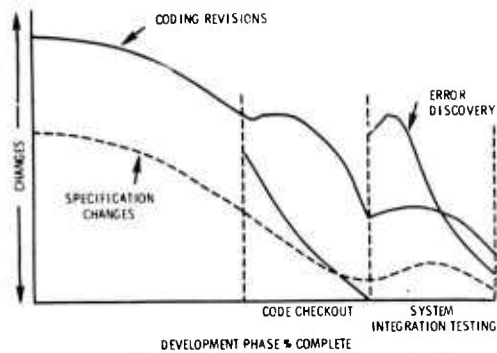


FIGURE 6. PROJECTED PROFILE FOR REQUIREMENTS CHANGES, ERROR DISCOVERY AND CODING REVISIONS

Because of the ease of changing software, as opposed to hardware, software changes are frequently used to effect mission changes and to correct deficiencies in other subsystem areas. Excessive requirement changes in the software can indicate potential hardware problems and a lack of maturity in the system requirements. Figure 6 depicts the normal behavior pattern for Engineering Change Orders issued against the Design Specification. This experience curve is analogous to the engineering traffic curve for hardware, in that it follows a downward trend, and then experiences smaller and smaller peaks as each successive level of testing is undertaken. The net effect resembles a damped sine wave. Significant deviations from this general form should be identified as to cause. Engineering Change Orders issued against the Design Specification cause the revision level of the software to be changed, and thus the rate of change of revision level can also be used as an indicator of program development maturity.

The percent of memory and speed yet uncommitted appears to be a promising indicator, but additional data will have to be gathered before this indicator can be quantified. Small values for uncommitted speed and memory have implications relative to the ability to absorb future changes and the difficulty in performing all required functions within the remaining capacity.

#### CONCLUSIONS

Preliminary findings of this study indicate that various elements of production readiness can be measured. Additionally, it has been determined that while each system is unique, there exists a number of common characteristics which can be compared on a system-by-system basis.

The first phase of the baseline indicators study has identified a list of measurable indicators, established methods for their analysis, and resulted in the collection of a substantial amount of empirical data from existing programs. The next phase of the study will be devoted to establishing the relationship between the initial values for the indicators and the program outcomes in terms of acquisition cost, schedule, and performance.



# PRODUCTION READINESS OF COMPUTER SOFTWARE

Lee A. Schumacher  
DoD Product Engineering Services Office  
c/o DLA, Cameron Station  
Alexandria, VA 22314

## Introduction

This paper addresses a problem often neglected during a Production Readiness Review (PRR) - determining the "production readiness" of the computer software used by the system. The problem is largely the result of the abstract nature of software. Nevertheless, ways must be found for the PRR team to make an accurate assessment of the risks involved in going into production with the existing software.

## The Software Production Problem/Software "Failures"

At the onset it is important to state the major distinction, from a PRR point of view, between software and hardware. The hardware production problem addressed during a PRR is whether or not copies of the prototype hardware produced during engineering development can be effectively produced in the factory. The software production problem is quite different.

Once the first copy of error-free software is available, producing duplicate copies is straight forward. The software media may be magnetic tape, magnetic disk or even especially manufactured Read Only Memories. No matter which media is used, duplication and verification of the duplication is relatively easy. The difficulty is in producing the first error-free copy and in testing it. Unlike hardware, software does not have a Mean-Time Between-Failure. It does not "fail" when it "wears out" like hardware does. Software "fails" when an error in the coding produces an incorrect response to a given input. The range of incorrect responses goes from providing an incorrect answer to halting the computer. The software errors were always in the coding but not recognized as such. A simple software error, such as a keypunching error, is usually easy to find and eliminate because many values of input produce incorrect responses. (In fact, software development programs can often locate such errors.) This is not the case for complex software errors. For example, a complex software error might produce an incorrect response only when one system starts at a particular point in time relative to another; any other starting time produces the correct response. Since relatively few inputs (or maybe only a single one) produce incorrect responses, complex software errors are extremely difficult to find.

## Importance of Assessing Software Status

Figure 1 shows the trend during the last decade of adding more and more embedded computer hardware and software to avionics systems.

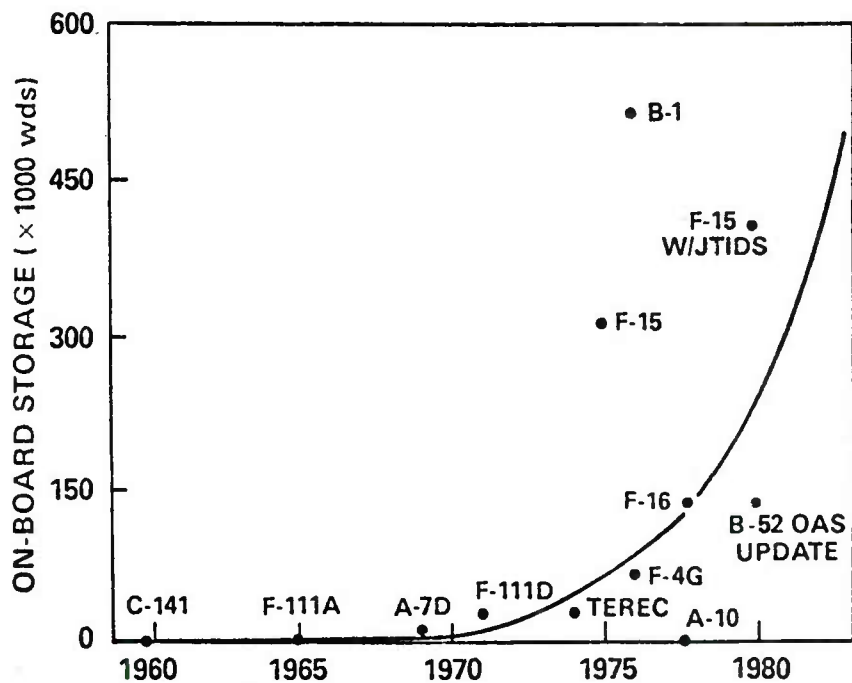


Figure 1. Avionics Software Growth

Most engineers are familiar with the large decrease in computer hardware costs during the last several years. Similar decreases have not come about in the software area, largely due to the labor intensity of the software development process. This results in the projections of software and hardware costs for DoD embedded computers during the 80's shown in Figure 2.

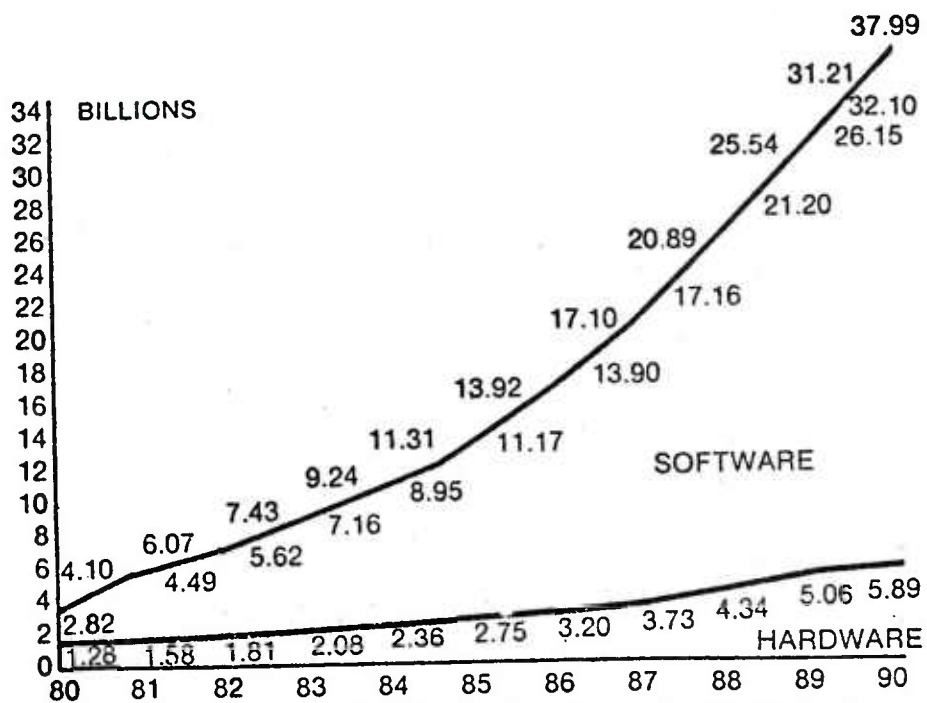


Figure 2. DoD Embedded Computer Market

The chart, taken from the October 27, 1980 issue of Electronic Engineering Times, shows that hardware costs will increase 4½ times while the software costs will increase over 11 times. As software becomes a larger and larger percentage of total acquisition costs, it becomes more and more important for the PRR team to assess the software status during their reviews.

A second reason software status should be assessed during the PRR is that software, like hardware, is more expensive to correct in the field than in the factory. The third and most important reason for software assessment is that inoperable software will result in a system that is useless in the field. Not all corrections may be made by "just changing software." Some corrections may require hardware modifications; the need for such modifications can not be known until the entire system (including software) is adequately tested. The PRR team should be extremely wary of any system which is ready for full scale production except for problems "just in the software."

### Software Problem Areas

There have been several recurring software problems that have been present in embedded computer systems developed in the past. There is only a limited amount of computer memory available in a given embedded computer. There is also only a limited amount of computer processing time available. (For example, all processing of a given set of radar data must be accomplished before the next set of data arrives.) When memory or computation time limits are approached, programmers must employ error-prone techniques that produce computer coding that is difficult to debug and almost impossible to modify in later years.

Determination of software development status is very difficult and in the past has often been left to the programmers and analysts most directly involved in the development process. Managers have been provided reports on the percent completion of the software. Typically progress was good in the early phases. However, at around the 90 percent completion point, many analysts realized system integration and testing would be more time consuming than originally planned. Also the problem to be solved usually evolves into something quite different than the one originally specified. This results in the type of curve shown in Figure 3.

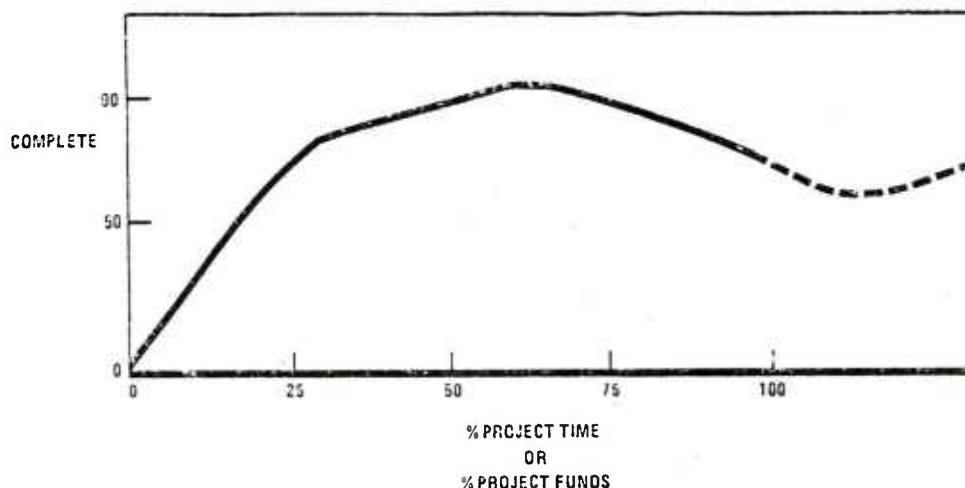


Figure 3. Estimate of Software Status

Note that the estimate of percent completion goes from an optimistic 90 percent half way through the project to the more realistic 60 percent at the originally-planned project completion date. This "90 percent completion problem" is largely the result of applying less engineering discipline to software than to other areas during the engineering development process.

### Software Indicators

Four software readiness indicators that should be available during a PRR are (1) memory utilization, (2) available computation time, (3) software error discovery rate, and (4) Software Engineering Change Order rate.

Figure 4 shows the anticipated pattern of (a) error discovery rate, (b) amount of coding that must be revised to correct the errors and (c) requirement changes.

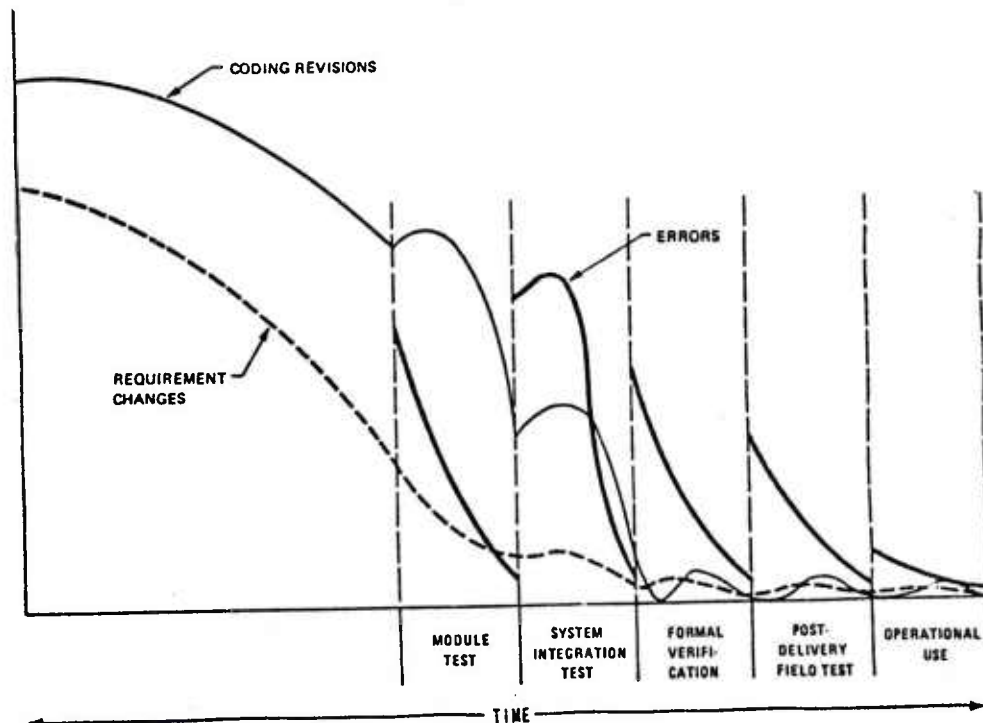


Figure 4. Anticipated Software Trends

Note that entering each new phase produces bumps on each of the curves when new classes of problems are seen for the first time.

Figure 5 shows memory or core allocation for an actual embedded computer system.

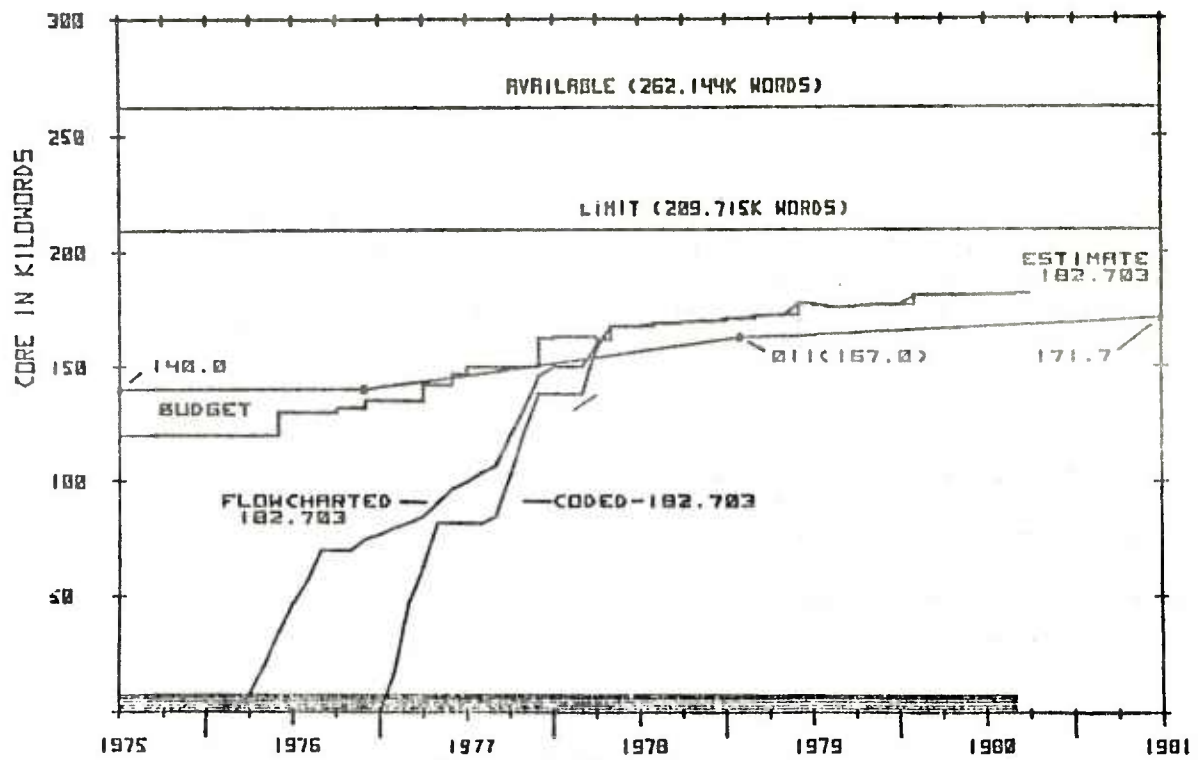


Figure 5. Memory Allocation

The relatively straight line shows the memory allocation budgeted at the beginning of the project. The stepped line shows periodic updates based on actual memory allocation. Note that twenty percent of the available memory was reserved for further expansion of the system. This memory reserve could be used to modify the system to accommodate different enemy threats or to make the system easier to use.

Figure 6 shows computation time allocation for the same system.

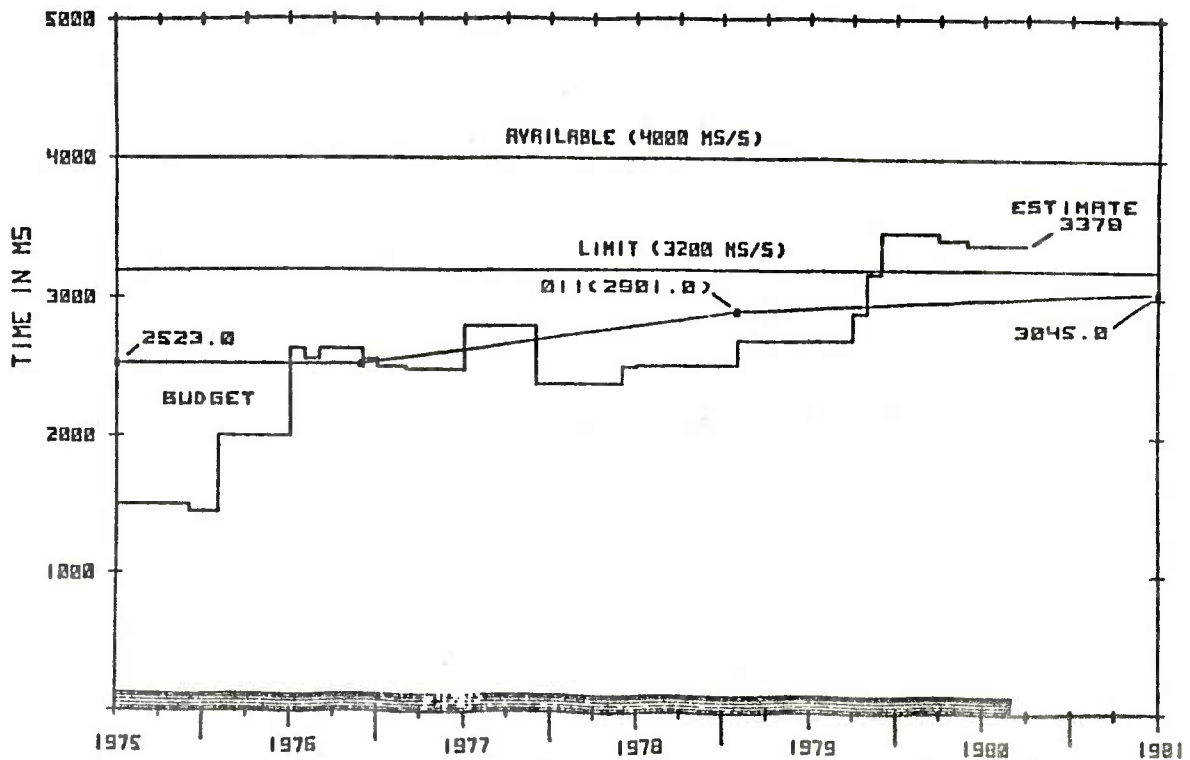


Figure 6. Computation Time Allocation

(Since four computers are processing data concurrently, there is a maximum of 4000 milliseconds of processing time available in each real-time second.) Note the current estimate of computation time exceeds the specified limit. It must be decided whether to leave the software as written and accept a reduced reserve or to maintain the twenty percent reserve at the expense of rewriting some of the code, possibly using some of the undesirable techniques previously mentioned.

Figure 7 shows monthly software error discovery rate as a function of time.

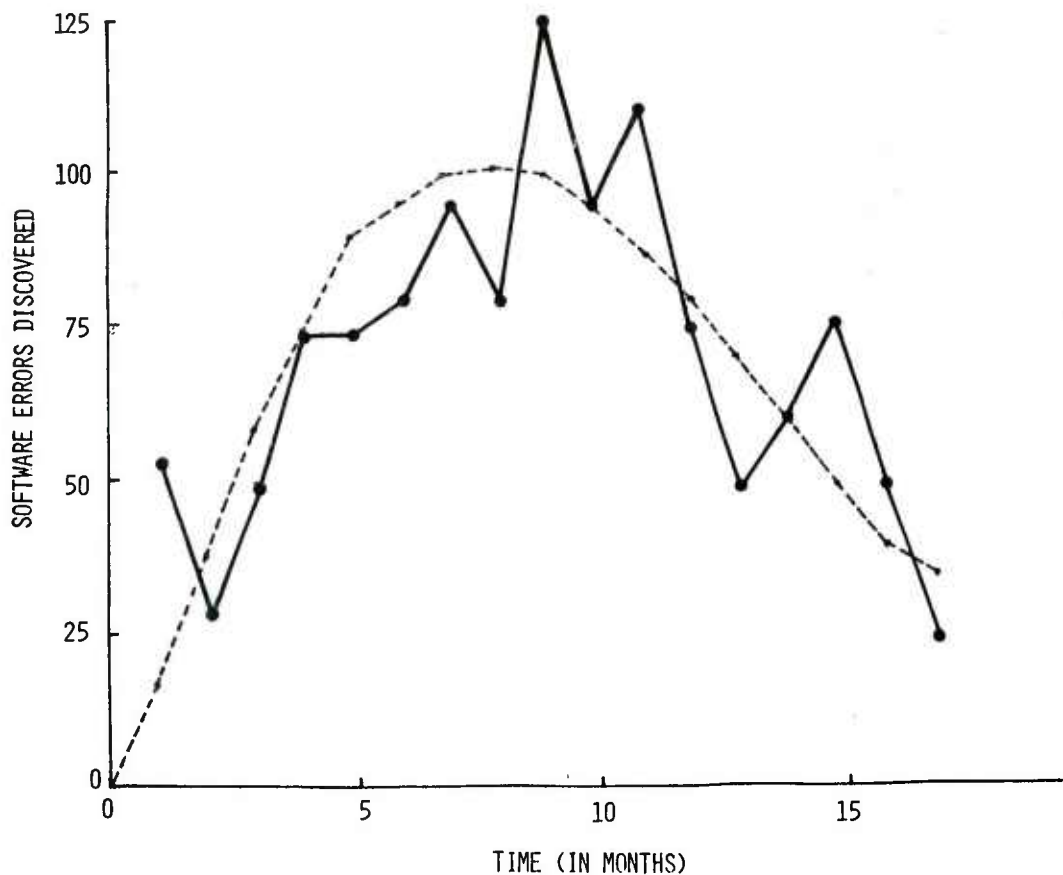


Figure 7. Software Errors Discovered

The points connected by the solid line indicate actual data points while the dashed lines shows the result of the best Rayleigh distribution fit to the points. The trend is obviously good and the software seems under control.

Figure 8, from the same project, gives quite a different picture. (The time period of Figure 7 covers approximately the second half of the time period shown in Figure 8.)

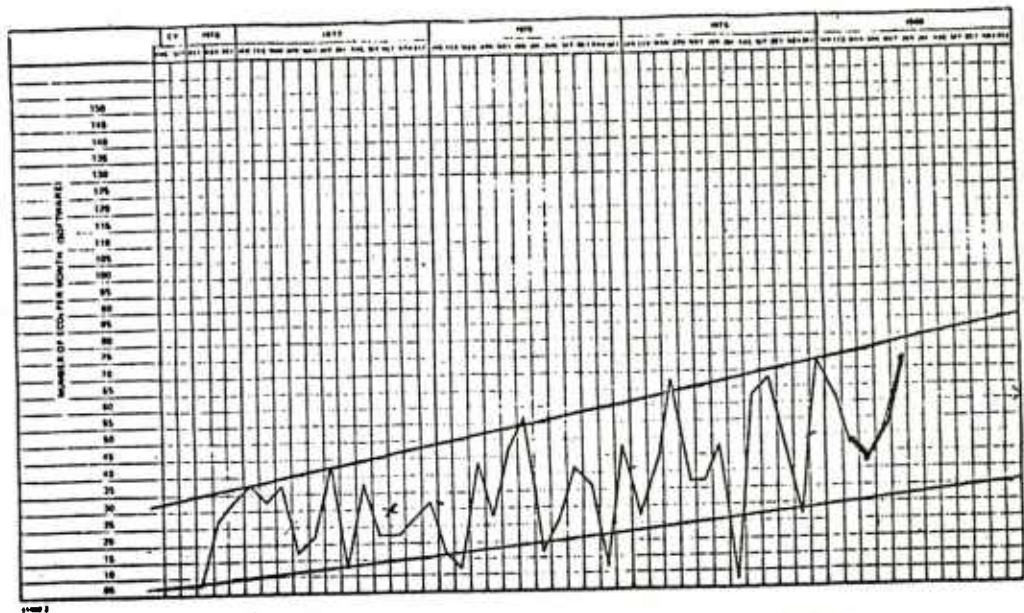


Figure 8. Software Engineering Change Orders

The profile of monthly software engineering change order activity clearly indicates that the software requirements have not stabilized. Comparison of Figures 7 and 8 illustrates the advisability of examining more than one indicator of software maturity.

If formal software testing is required, the Mean-Time-Between-Computer-Program-Errors can be plotted as a function of number of hours of testing.

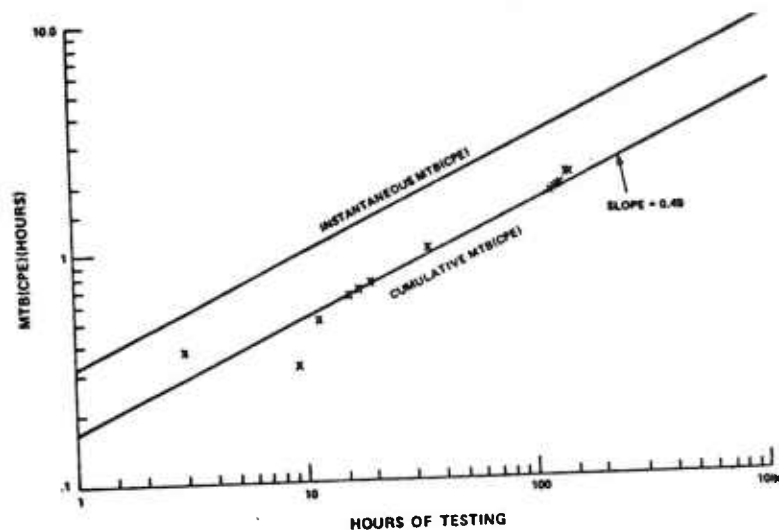


Figure 9. Mean Time Between Computer Program Errors

In the example in Figure 9 there is a good linear fit when the data is plotted on log-log paper. Note the difference between the curve for instantaneous and cumulative values. Which Mean-Time-Between-Computer-Program-Errors to use must be carefully spelled out in the testing procedures if this parameter determines whether the software passes or fails the formal software test.

### Software that is often not Reviewed

There are several important software items that are often ignored during PRRs. The first is non-deliverable software that directly effects production of hardware. An example is the software used to drive computer-controlled machines. Although there is strict configuration management of engineering drawings, there may be no configuration management of the software that determines what will be produced.

Development costs for Automatic Test Equipment software are often greater than for operational software. For example, the F-16 program had 28 operational computer programs compared to 600 for test and support. Many of the test and support programs may have a direct effect on factory production if, as in the case of the F-16, the test equipment was to be used for factory testing of electronic subsystems.

There is a large unseen base on which the application software depends. Figure 10 shows this relationship as an iceberg.

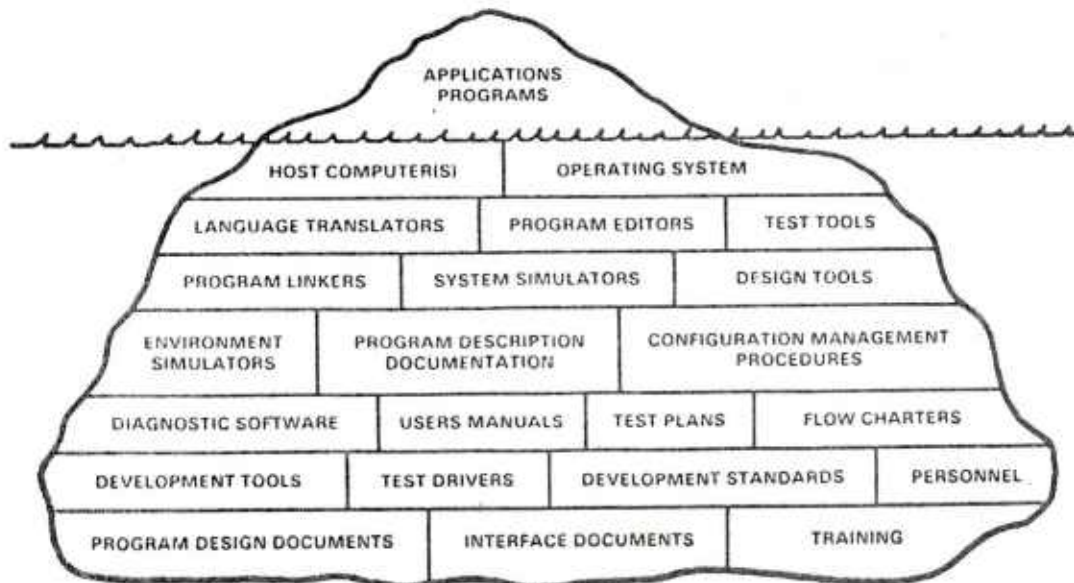


Figure 10. The Software Iceberg

A series of incremental PRR visits facilitate the discovery of inadequacies in the "underwater" software items. Such items may have a direct impact on obtaining the operational software on time. In addition, they form the basis of support and changes after deployment. Examination of these items during PRRs would insure user's later needs can be met.

### DPESO Software Projects

The DoD Product Engineering Services Office (DPESO) is involved with two projects directly related to reviewing software during PRRs. In 1977 the Chairman of the DoD Management Steering Committee for Embedded Computer Resources and I developed "Embedded Computer Resources and the DSARC Process - A Guidebook\*." The guidebook included questions that the Office of the Secretary of Defense staff might ask the

Program Manager's staff prior to DSARCs I, II, and III. This guidebook is now being revised and a section on Production Issues is being added to the chapter covering DSARC III.

The second area being investigated is whether a computer model can be developed to help a PRR team determine software development status. This is a joint study between DPESO and the DoD Computer Institute. DPESO will be providing actual contractor data obtained during PRR visits while the Computer Institute will be providing the computer modeling expertise. This study has just started and will take approximately 14 months to complete.

### Conclusion

This paper addressed the importance of measuring software during the PRR and touched on some indicators that can be used to assess software development status. This is a relatively new area for PRRs and much remains to be learned. Hopefully meetings like the OSD/Joint Services Production Readiness Reviews Conference will provide a forum for exchanging ideas on how we can better determine the production readiness of computer software.

Ideas on how to assess software status as well as actual data are solicited. They should be sent to Lee Schumacher, DPESO, c/o DLA, Cameron Station, Alexandria, VA 22314. Telephone (703) 756-2335 or Autovon 289-2335.

\* The 1977 edition of the guidebook is available through the Defense Technical Information Center (formerly the Defense Documentation Center) or the National Technical Information Service as AD Number A046398.





# **DEFENSE CONTRACT ADMINISTRATION SERVICES**

COLONEL EVANS WARNE, USAF

## DLA/DCAS ROLE IN PRODUCTION READINESS REVIEWS

### INTRODUCTION

In order to improve communications and effectiveness of Defense Contract Administration Services (DCAS) support in Production Readiness Reviews (PRRs), it is essential that Program Managers be familiar with how DLA(CAS) is organized, what functional capabilities it possesses, what support can be provided, and how to acquire this support. The objective of this presentation is to provide a review of the knowledge required to insure a coordinated effort is achieved among the Program Management Offices and the DCAS elements involved in accomplishing PRRs.

### ORGANIZATION

Headquarters DLA is located at Cameron Station, Alexandria, Virginia. Lt Gen Gerald J. Post, USAF, is the Director. He has two deputies. One, MG Robert C. Gaskill, USA, heads the buying functions of DLA. These include: Contracting Directorate, Supply Operations Directorate, Technical & Logistics Services Directorate, six Supply Centers, four Supply Depots, and six Service Centers. The second deputy to Lt Gen Post is RADM Gerald J. Thompson who heads the Defense Contract Administration Services functions of HQ DLA. Two executive directorates support RADM Thompson. The first, headed by Mr. William V. Gordon (SES) is the Executive Directorate, Contract Management. There are

nine divisions under Mr. Gordon (see attached chart) responsible for providing Headquarters policy and direction on matters involving Contract Management. The second Executive Director under Admiral Thompson is the Quality Assurance Directorate headed by RADM Cruden. Under Admiral Cruden are three divisions (see attached chart) responsible for providing policy, guidance, and technical assistance on matters involving contractor compliance with contract quality requirements and efforts to assure the product delivered to the government meets the specifications delineated by contract.

DCAS is currently organized into nine geographical Regions. They are: Atlanta, Boston, Chicago, Cleveland, Dallas, Los Angeles, New York, Philadelphia, and St. Louis. Scattered within these Regions are 37 Management Areas (DCASMAS), 34 Plant Representative Offices (DCASPROs), and 900 residencies.

### FUNCTIONS

The organizational structure by function at HQ DLA within DCAS is mirrored in each of the field offices. The Systems & Engineering Division, or in the field, the Systems & Engineering Office, is the Office of Primary Responsibility for PRRs. There are approximately 400 engineers assigned in the field offices. In addition, within DCAS there are 510 Quality Assurance Engineers and 800 Industrial Specialists. The

personnel assigned to DCAS are highly trained and experienced professionals. They constitute a considerable body of technical expertise familiar with the capacity and capability of American Industry. This represents a substantial resource to Program Managers which must be cultivated and can be utilized to get the most effective use of our limited Defense Budget.

#### PRR SUPPORT

Procedures for DCAS support of PRRs are contained in DLAM 8300.1, Production Manual for Contract Administration Services. Other references are:

DoD Instruction 5000.38, Production Readiness Reviews

DoD Directive 5000.34, Defense Production Management

MOU between DLA(CAS) and DCS/Systems, AFSC, 6 Sep 73

The Program Manager should call or write the Commander of the cognizant Contract Administration Office, either the DCASMA or the DCASPRO Commander of the area in which the PRR is to be performed. Addresses and telephone numbers are found in DoD Handbook 4105.59, DoD Directory of Contract Administration Services Components. The letter should request that both the Director of Contract Management and the Director of Quality Assurance be alerted to the requirement for a PRR. A courtesy copy of this letter should be sent to the Commander of the Region in which the PRR is being performed,

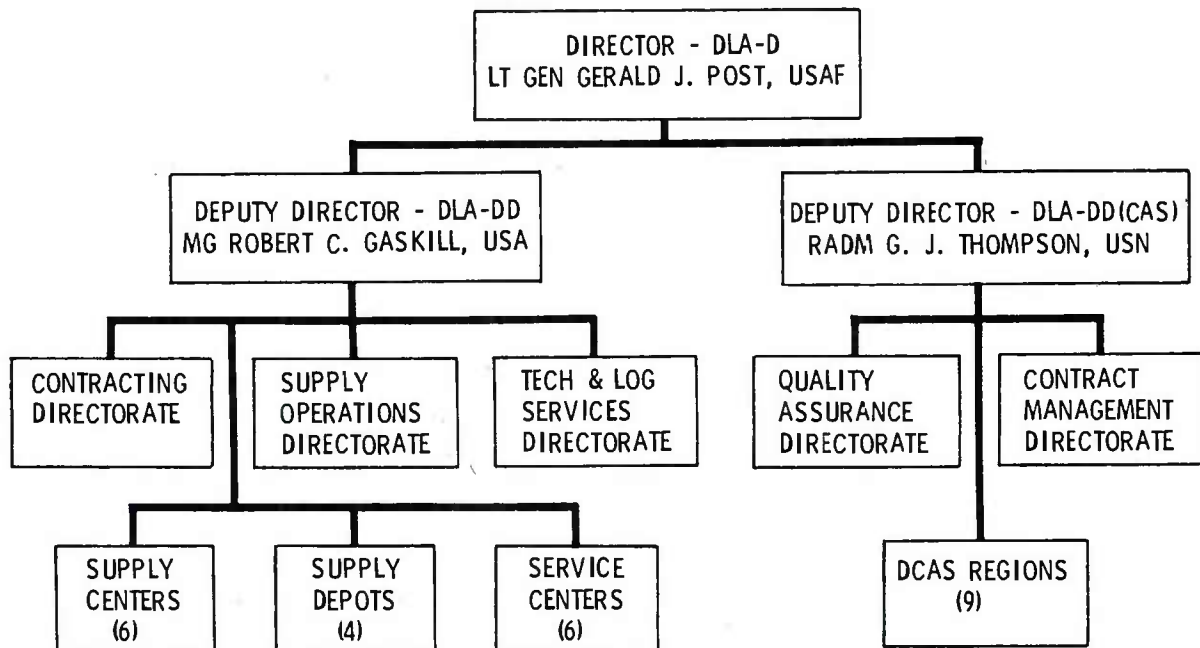
and also a copy should be provided to HQ DLA, ATTN: DLA-AE, Cameron Station, Alexandria, Virginia, 22314. In the letter, identify the type of support needed and the areas to be covered during the PRR. The Program Manager can then expect DCAS representatives to be onsite and ready to assist the PRR Team when it arrives. He can expect an in-briefing from the assigned DCAS engineer on the strengths and weaknesses of the contractor involved. He can also expect that our Engineers, Industrial Specialists and Quality Assurance Specialists are generally well equipped to answer questions pertaining to the topics listed on the attached charts under "PRR Support." These specialists should also be available to provide surveillance and follow up on any corrective actions required, and to provide progress reports back to the Program Manager at some agreed to interval.

The Systems & Engineering Division (DLA-AE) at HQ DLA should be notified any time a serious problem arises with regards to a lack of support for any PRR within DCAS, or if assistance is needed in acquiring support. Contact either Colonel Warne or Dr. Moul on AV 28-47132.

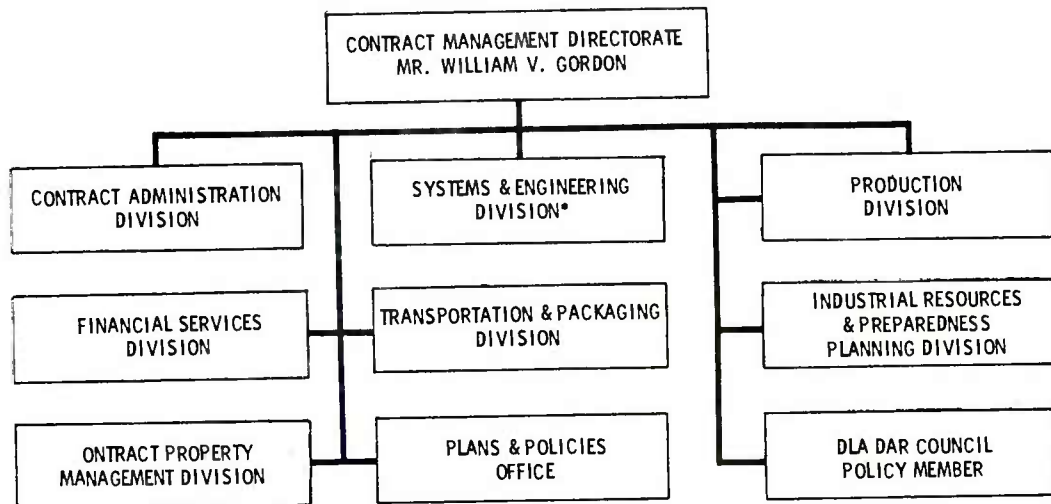
## DLA/DCAS ROLE IN PRRs

- ORGANIZATIONAL STRUCTURE
- FUNCTIONAL CAPABILITIES
- SUPPORT TO PRR TEAM

### HQ DLA ORGANIZATION

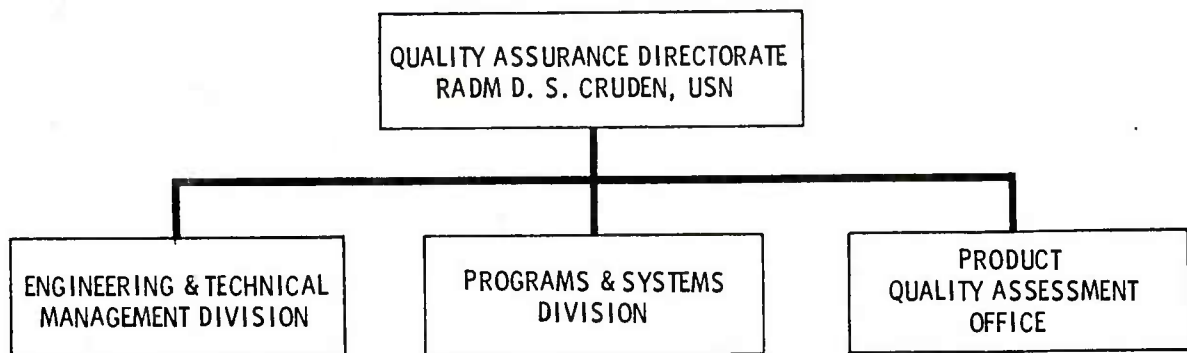


HQ DLA ORGANIZATION (DLA-A)

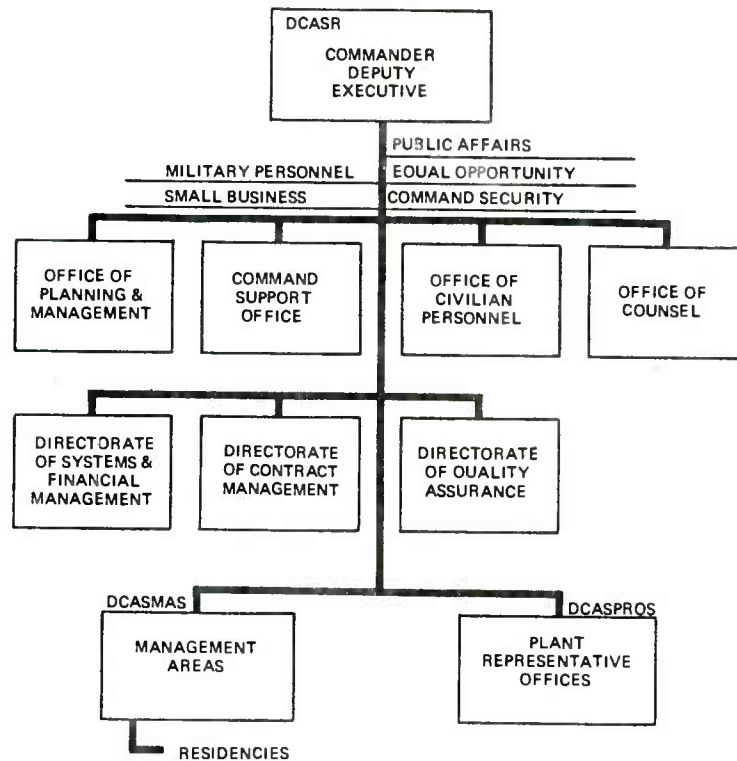


\*OPR FOR PRODUCTION READINESS REVIEWS (PRRs)

HQ DLA ORGANIZATION (DLA-Q)



## DEFENSE CONTRACT ADMINISTRATION SERVICES REGION



## DCASR BOUNDARIES AND NUMBER OF COMPONENTS



## DCAS SUPPORT TO THE PRR TEAM

EVENT	ACTIONS
● NOTIFICATION FROM PROGRAM MANAGER	DCAS ENGINEER IS DESIGNATED DCAS SPECIALISTS ARE SELECTED
● ARRIVAL OF PROGRAM MANAGER TEAM	BRIEFINGS PROVIDED BY DCAS
● PLANT VISIT(S)	ARRANGEMENTS/FACILITIES FULL/PART TIME SUPPORT FROM SPECIALISTS AS NEEDED
● IN BETWEEN/AFTER PLANT VISITS	COORDINATION & FOLLOWUP
● POST REVIEW	SURVEILLANCE OF ACTION ITEMS PERIODIC REPORTING

## DCAS SUPPORT TO THE PRR TEAM

- PLANT RESOURCES / FACILITIES
  - ADEQUACY FOR RATE
  - TIMELY ACQUISITION / INSTALLATION
  - AUTOMATED PRODUCTION TECHNIQUES
- CONTRACTOR PERSONNEL
  - MANNING LEVELS
  - SKILLS DEVELOPMENT / TRAINING
  - CERTIFICATION
- PRODUCTION ENGINEERING / PLANNING
  - SCHEDULE COMPATIBILITY
  - COST REDUCTION
  - ALTERNATIVE CAPACITIES
  - CONFIGURATION MANAGEMENT
  - HANDLING OF ENGINEERING CHANGES
  - MANAGEMENT INFORMATION SYSTEM ADEQUACY

## DCAS SUPPORT TO THE PRR TEAM

- MATERIALS / PURCHASED PARTS
  - LONG LEAD ITEMS
  - PROCUREMENT PLAN
  - SELECTION OF SUBCONTRACTORS
  - VISIBILITY OF SUBCONTRACTORS
- QUALITY ASSURANCE
  - INTEGRATION WITH PRODUCTION PLANNING
  - CORRECTIVE ACTION
- CONTRACT ADMINISTRATION
  - ATTITUDES
  - CHARACTER
  - WORKING RELATIONSHIPS

## CONCLUSIONS

- ON SITE CAPABILITY
- FUNCTIONALLY ORGANIZED
- TECHNICALLY ORIENTED
- DEDICATED TO SUPPORT PROGRAM MANAGERS

**Office of  
Manufacturing Technology**



US ARMY MATERIEL DEVELOPMENT  
AND READINESS COMMAND

ALEXANDRIA, VIRGINIA

US ARMY "PRODUCTION READINESS REVIEW" OVERVIEW



PRESENTED TO: OSD/JOINT SERVICES PRODUCTION  
READINESS REVIEW CONFERENCE

PRESENTED BY: FREDERICK J. MICHEL  
ACTING CHIEF, OFFICE OF  
MANUFACTURING TECHNOLOGY

19 NOVEMBER 1980

US ARMY  
"PRODUCTION READINESS REVIEW"  
AN OVERVIEW

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19 NOVEMBER 1980

## OUTLINE

PRR GUIDANCE

PRR RESPONSIBILITIES

SCOPE OF THE PRR

CONDUCT OF THE PRR

CONCLUSION - STATUS/LESSONS LEARNED

## OUTLINE

GOOD MORNING.

DURING THE NEXT FEW MINUTES I WANT TO GIVE YOU A SHORT OVERVIEW ON SOME OF THE KEY POINTS OF PRODUCTION READINESS REVIEWS AS CONDUCTED BY THE ARMY.

- FIRST I WILL GIVE YOU AN OVERVIEW OF THE PRODUCTION READINESS REVIEW, IN TERMS OF GUIDANCE AND OBJECTIVES.
- I WILL THEN GO INTO SOME DETAILS ABOUT THE SCOPE OF THE PRR AND WHAT CRITERIA WE USE TO JUDGE PRODUCTION READINESS.
- I'LL TALK ABOUT THE CONDUCT OF THE PRR - AND FINALLY,
- WHAT WE'VE LEARNED ABOUT PRR'S BASED ON THE ONES WE'VE CONDUCTED THUS FAR.

AS YOU CAN SEE FROM THE OUTLINE I AM GOING TO SPEND ONLY A SMALL AMOUNT OF TIME ON THE REGULATION, BUT AM GOING TO CONCENTRATE ON THE PRACTICAL ASPECTS.

## PRR GUIDANCE

- REFERENCE: DODD 5000.34, DEFENSE PRODUCTION MANAGEMENT  
DODI 5000.38, PRODUCTION READINESS REVIEW  
AR 70-67, PRODUCTION READINESS REVIEW
- PRR'S FOR ALL MAJOR/NON-MAJOR SYSTEMS
- PRR RESULTS TO DECISIONMAKERS:
  - ASARC III/IIIA
  - DSARC III/IIIA
  - DEVA IPR
  - SPECIAL PRODUCTION IPR'S
- ARMY PRODUCT ENGINEERING SERVICES OFFICE (APESO)
- FOR MAJOR SYSTEMS, INDEPENDENT DOD ASSESSMENT (DPESO)

### PRR GUIDANCE

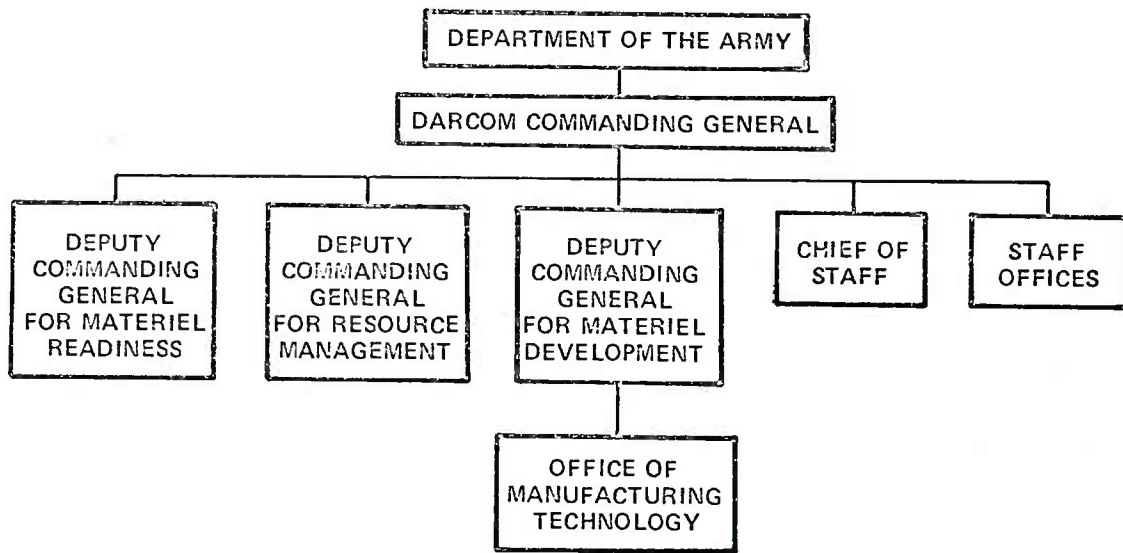
THREE BASIC REGULATORY DOCUMENTS CONCERNING PRODUCTION READINESS REVIEWS HAVE BEEN PUBLISHED OVER THE PAST 2 YEARS, NAMELY DODD 5000.34, DODI 5000.38 AND AR 70-67. AR 70-67 IMPLEMENTS THE DOD DIRECTIVES/INSTRUCTIONS AND WAS EFFECTIVE 1 JANUARY 1980.

WITHIN THE ARMY, PRR's ARE REQUIRED FOR ALL SYSTEMS, AND THE RESPECTIVE PROJECT MANAGERS ARE RESPONSIBLE FOR HAVING THEM CONDUCTED.

IN ADDITION TO THE PRR ITSELF, THE ARMY REQUIRES AN INITIAL PRR (IPRR) EARLY IN THE ENGINEERING DEVELOPMENT CONTRACT AND NOT LATER THAN 12 MONTHS PRIOR TO MILESTONE III DECISIONMAKERS -

THE ARMY PRODUCT ENGINEERING SERVICES OFFICE (APESO) HAS BEEN ESTABLISHED WITHIN THE OFFICE OF MANUFACTURING TECHNOLOGY AT DARCOM TO ASSIST IN THE CONDUCT OF PRR's AS WELL AS TO ESTABLISH AND REINFORCE PRR POLICIES/PROCEDURES.

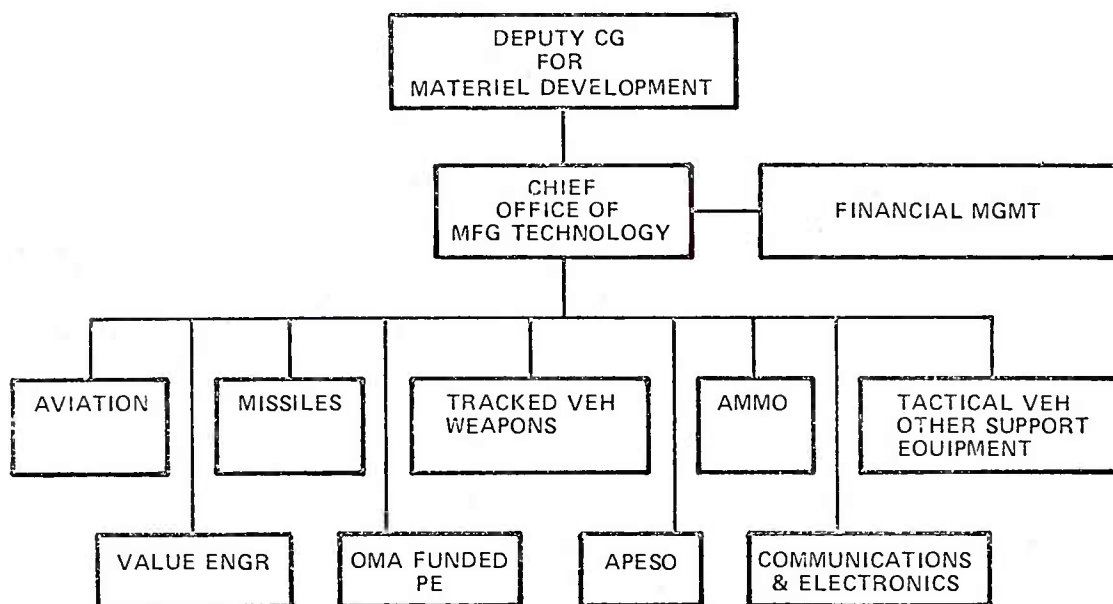
# ORGANIZATION CHART



## OFFICE OF MANUFACTURING TECHNOLOGY

THIS CHART SHOWS THE POSITION OF THE OFFICE OF MANUFACTURING TECHNOLOGY  
WITHIN THE ARMY STRUCTURE.

## OFFICE OF MANUFACTURING TECHNOLOGY



### OMT ORGANIZATION

THIS CHART SHOWS THE ORGANIZATION OF THE OFFICE OF MANUFACTURING TECHNOLOGY. ALL PRODUCTION RELATED FUNCTIONS IN THE LIFE CYCLE OF A WEAPONS SYSTEM WHICH CAN AFFECT END ITEM COST ARE IN ONE ORGANIZATION STARTING WITH PRODUCIBILITY ENGINEERING PLANNING (PEP) AND ENDING WITH PRR's.

## PRR RESPONSIBILITIES

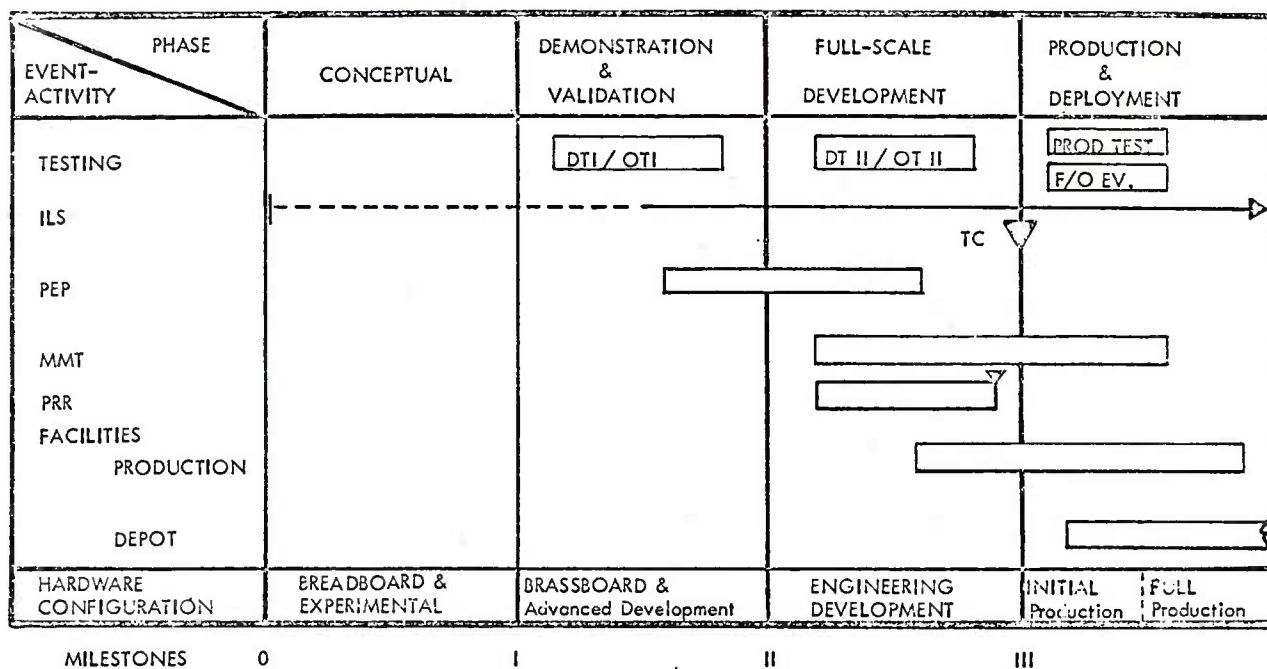
### ARMY PESO

- PROVIDE PRR CONSULTATION
- PARTICIPATE IN PRR'S
- ASSIST IN RECRUITING TEAM
- ASSIST WITH ANALYSIS
- COORDINATE WITH DOD PESO
- PROVIDE EXAMPLES OF PRR PROCEDURES
- ASSIST IN PREPARING PRR SOW FOR RFP

### PRR RESPONSIBILITIES

THE ARMY'S PRODUCT ENGINEERING SERVICES OFFICE WAS CREATED TO ESTABLISH AND REINFORCE PRR POLICIES/PROCEDURES. BUT, FURTHER, IT WAS CREATED AS A SERVICE ORGANIZATION. WE ASSIST THE PM IN PLANNING AND CONDUCTING PRR's IN ACCORDANCE WITH THE REGULATIONS. IN ADDITION WE MAKE PRODUCTION ENGINEERING TALENT AVAILABLE FOR PARTICIPATION ON THE PRR TEAM TO HELP IN THE PRODUCTION READINESS ANALYSIS.

## LIFE CYCLE MANAGEMENT MODEL



### PRR AND THE LIFE CYCLE MANAGEMENT MODEL

THE PRODUCTION READINESS REVIEW IS AN INTEGRATED PART OF THE ARMY'S PRODUCT LIFE CYCLE.

FOR MAJOR SYSTEMS, THE PRR'S ARE CONDUCTED INCREMENTALLY, COMMENCING AS SOON AS POSSIBLE AFTER MILESTONE II AND THE FINAL PRR COMPLETED NLT 2 MONTHS PRIOR TO DSARC III / ASARC III / DEVAIPR; TO ALLOW ADEQUATE REVIEW BY THE MILESTONE III DECISION MAKERS.

## SCOPE OF THE PRR

### FORMAL EXAMINATION OF A PROGRAM'S:

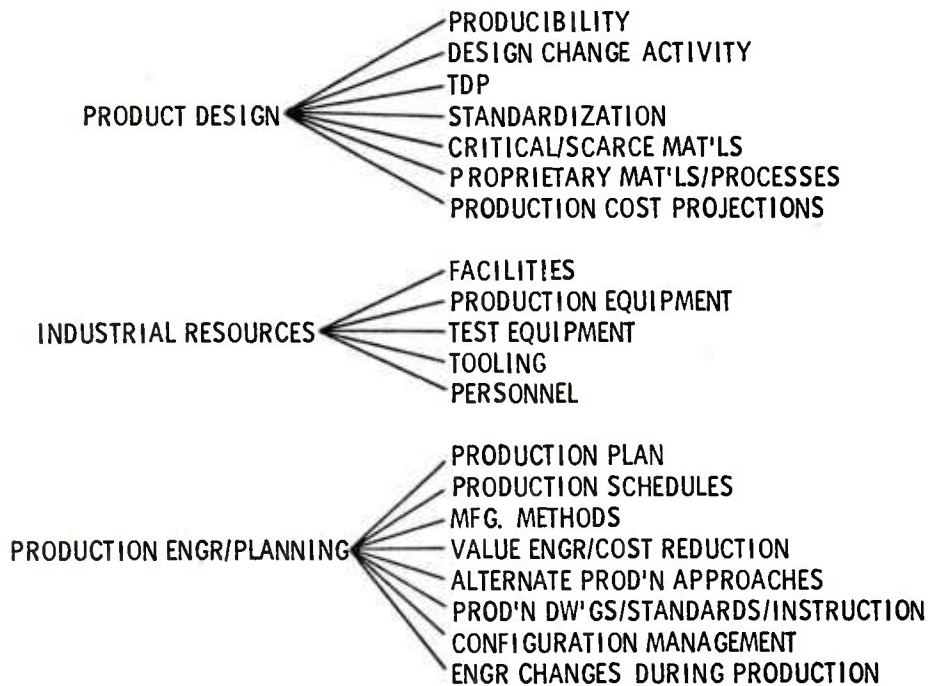
- PRODUCT DESIGN
- INDUSTRIAL RESOURCES
- PRODUCTION ENGINEERING/PLANNING
- MATERIAL/PURCHASED PARTS
- QUALITY ASSURANCE
- LOGISTICS
- CONTRACT ADMINISTRATION
- PROGRAM MANAGEMENT

### SCOPE OF THE PRR

NOW I'D LIKE TO GO A LITTLE DEEPER INTO THE SCOPE OF THE PRR.

AS YOU CAN SEE FROM THIS SLIDE, A PRR EXAMINES PRODUCTION READINESS ACTIVITIES "ACROSS THE BOARD". IT IS CONSIDERED ONE OF THE KEY MILESTONES IN THE LIFE CYCLE OF A WEAPONS SYSTEMS FOR IDENTIFYING POTENTIAL MANUFACTURING PROBLEMS.

# PRR CRITERIA



## PRR CRITERIA

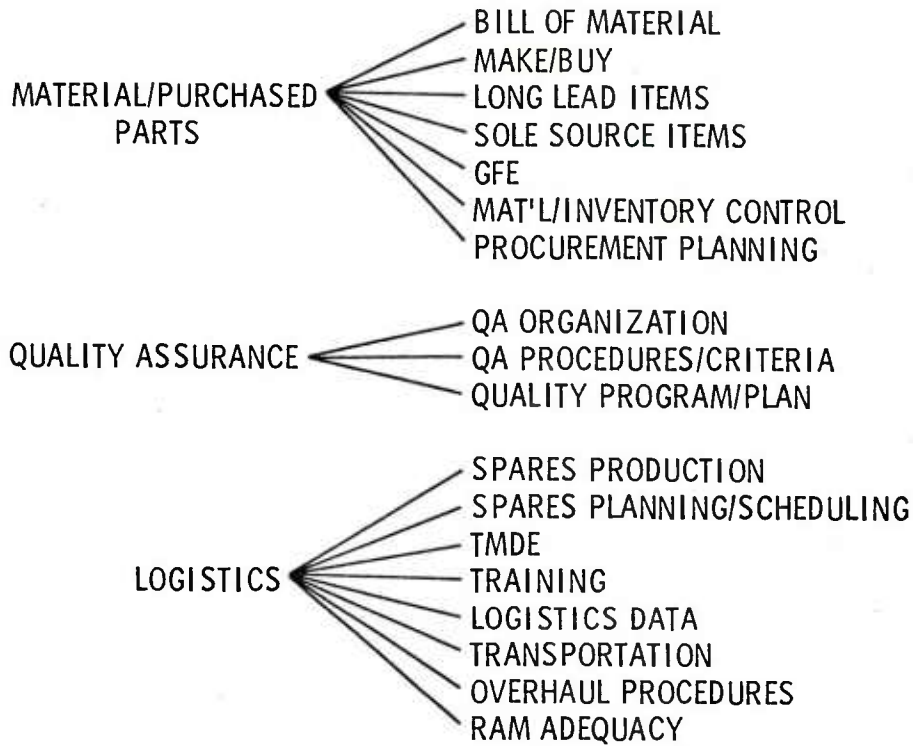
HERE IS A SOMEWHAT MORE DETAILED LISTING OF THE CRITERIA WHICH ARE USED TO JUDGE PRODUCTION READINESS PROGRESS.

- WITHIN PRODUCT DESIGN,
- PRODUCIBILITY
  - DESIGN CHANGE ACTIVITY, INDICATING MATURITY OF DESIGN.
  - STATUS OF THE TDP.
  - WHETHER THERE ARE RISKS RELATED TO USE OF CRITICAL OR PROPRIETARY MATERIALS AND PROCESSES.
  - THE RISK IN NOT MEETING CURRENT COST PROJECTIONS.

IN INDUSTRIAL RESOURCES, WE'RE LOOKING AT THE NUMBERS AND CAPABILITIES OF FACILITIES, EQUIPMENT AND TOOLING REQUIRED AS WELL AS PERSONNEL REQUIRED.

- FOR PRODUCTION ENGINEERING / PLANNING,
- A PRODUCTION PLAN.
  - INCLUDING MASTER SET-BACK SCHEDULES.
  - MANUFACTURING PROCESS IDENTIFICATION.
  - SHOP INSTRUCTIONS; WORKAROUND PLANS FOR PROBLEM AREAS.

# PRR CRITERIA



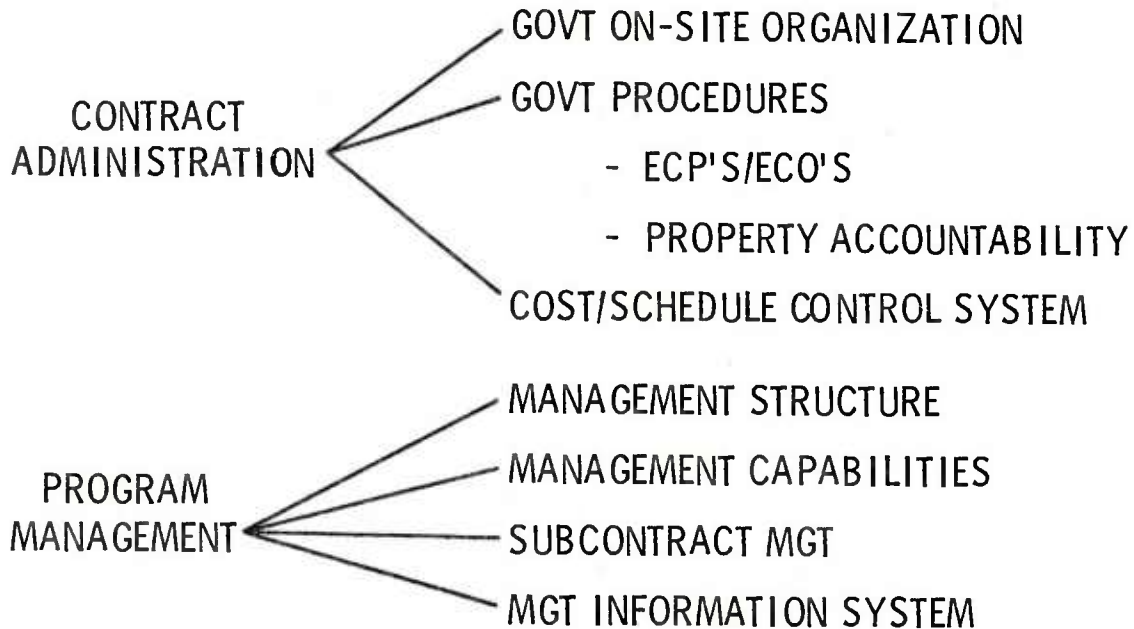
## PRR CRITERIA

IN MATERIALS/PURCHASED PARTS, A PLAN FOR ACQUIRING, SCHEDULING AND CONTROLLING ALL MATERIAL - - MAKE OR BUY.

A QA PLAN, WITH SPECIFIC QA PROCEDURES IDENTIFIED FOR THIS SYSTEM.

IN LOGISTICS, HAS PLANNING BEEN ACCOMPLISHED FOR SPARES, TMDE, TRAINING DEVICES, DATA, ETC. AND DOES THE CAPABILITY EXIST TO PRODUCE THESE ITEMS?

# PRR CRITERIA



## PRR CRITERIA

CONTRACT ADMINISTRATION - THE INTERACTION OF THE GOVERNMENT WITH THE CONTRACTOR.  
HAVE PROCEDURES BEEN FORMULATED AS TO DCAS'S ROLE ? DOES THE CONTRACTOR  
HAVE A VALIDATED CS<sup>2</sup> SYSTEM ?

IN PROGRAM MANAGEMENT, WE LOOK AT THE MANAGEMENT

- STRUCTURE AND CAPABILITIES OF A CONTRACTOR AND WHETHER THEY HAVE THE BACKGROUND TO ACCOMPLISH THE JOB.
- IS THEIR MANAGEMENT INFORMATION SYSTEM EFFECTIVE IN DEFINING PROBLEMS TO BE RESOLVED IN PRODUCTION.

# CONDUCT OF THE PRR

## FORMAL REVIEWS:

### INITIAL PRODUCTION READINESS REVIEWS (IPRR)

- REQUIRED FOR MAJOR SYSTEMS
- FIRST LOOK AT PRODUCTION READINESS STATUS
- INTRODUCE CONTRACTORS TO PRR'S
- COMPLETE 12 MONTHS BEFORE MILESTONE III

### PRODUCTION READINESS REVIEWS (PRR)

- FORMAL, DOCUMENTED, SYSTEMATIC REVIEWS
- FINAL LOOK AT PRODUCTION READINESS
- FORMAL RECOMMENDATION FOR MILESTONE III PRODUCTION DECISION
- COMPLETE 2 MONTHS BEFORE MILESTONE III

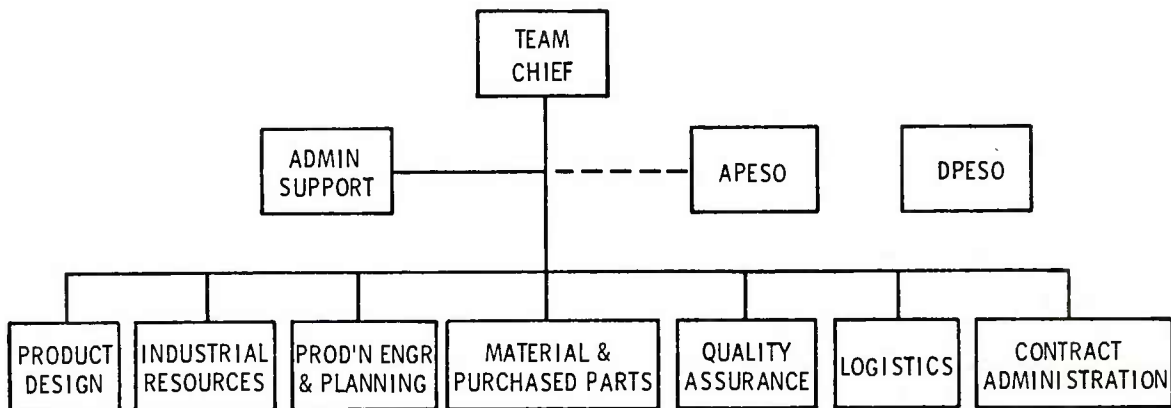
## CONDUCT OF THE PRR

THERE ARE TWO BASIC TYPES OF FORMAL REVIEWS IN THE ARMY'S PRR PROCESS - -

- THE INITIAL PRR, WHICH IS REQUIRED ONLY FOR MAJOR SYSTEMS, IS TO BE COMPLETED 12 MONTHS BEFORE MILESTONE III. WE RECOMMEND THE IPRR BE CONDUCTED AS SOON AS POSSIBLE AFTER MILESTONE II TO INTRODUCE THE CONTRACTORS TO WHAT IS EXPECTED OF THEM TO GET READY FOR PRODUCTION.
- THE PRR'S THEMSELVES ARE REQUIRED TO BE COMPLETED 2 MONTHS PRIOR TO MILESTONE III. WE RECOMMEND THAT THE PRR'S BE CONDUCTED ON AN INCREMENTAL BASIS THROUGHOUT ENGINEERING DEVELOPMENT WITH THE FINAL REVIEW SERVING AS THE BASIS FOR THE RECOMMENDATION AT DECISION POINT III.

# CONDUCT OF THE PRR

## ORGANIZATION / MANPOWER POSSIBLE TEAM ORGANIZATION



## CONDUCT OF THE PRR

THE USE OF FUNCTIONAL SUBTEAMS FACILITATES THE CONDUCT OF THE PRR ACTIVITIES. THIS SLIDE SHOWS A POSSIBLE BREAKOUT OF THOSE SUBTEAMS.

AGAIN, A MAJOR SYSTEM ACQUISITION MAY HAVE ALL OF THESE ITEMS AND COULD INCLUDE AS MANY AS 50 PEOPLE; WHEREAS, A NON-MAJOR SYSTEM OR A VENDOR TO A MAJOR SYSTEM MAY ONLY HAVE A 2-3 MAN TEAM.

APESO ACTS AS AN ADVISOR TO THE TEAM OR AS A TEAM PARTICIPANT AND DOD PESO ACTS AS AN INDEPENDENT OBSERVER.

THE CORE OF THE TEAM SHOULD BE NON-PMO PERSONNEL, BUT THEY CAN BE SUPPLEMENTED WITH KNOWLEDGEABLE PERSONS FROM THE PMO. WE ENCOURAGE THE USE OF THE ON-SITE GOVERNMENT PERSONNEL. SOME PM'S HAVE HIRED CONSULTANTS TO PARTICIPATE IN THE PRR.

# CONDUCT OF THE PRR

## THE FINAL PRR REPORT

- FORMAL REPORT TO PM
  - IDENTIFIES POTENTIAL PROBLEMS
  - PROVIDES RISK ASSESSMENTS: COST/SCHED/  
QUALITY/LOGISTICS
  - RECOMMENDATIONS
- PM PROVIDES PRELIM REPORT TO ASARC/DSARC/IPR  
MEMBERS 6 WEEKS PRIOR TO PRE-REVIEW

### CONDUCT OF THE PRR

THE FINAL REPORT IS SUBMITTED BY THE TEAM CHIEF TO THE PM. IT WILL IDENTIFY THE FINDINGS, POTENTIAL PROBLEMS, ASSESSMENTS OF RISKS IN EACH OF THE FUNCTIONAL AREAS AND RECOMMENDATIONS.

THE PM SUBMITS THE FINAL REPORT TO APESO AND THE MILESTONE III DECISION - MAKERS.

# ARMY PRR STATUS

COMPLETED	IN-PROCESS	NEXT 12 MONTHS
<ul style="list-style-type: none"> <li>• XM1</li> <li>• CH47</li> <li>• MLRS</li> <li>• PATRIOT</li> <li>• COPPERHEAD</li> <li>• GEMSS</li> <li>• AN/APR 39</li> <li>• IFV/CFV</li> </ul>	<ul style="list-style-type: none"> <li>• AAH</li> <li>• HELLFIRE</li> <li>• VIPER</li> </ul>	<ul style="list-style-type: none"> <li>• DIVAD</li> <li>• SINGGARRS</li> <li>• PLRS/TIDS</li> <li>• MD918/GRC</li> <li>• 30MM AMMO</li> <li>• STINGER/POST</li> <li>•</li> <li>•</li> <li>•</li> </ul>

## ARMY PRR STATUS

THIS SLIDE INDICATES THE HISTORY OF THE ARMY-CONDUCTED PRR's. WE HAVE 3 PRR's ON-GOING NOW AND WE ANTICIPATE THAT AT LEAST ANOTHER 6 WILL BEGIN DURING THE NEXT 12 MONTHS. IN ORDER TO FIT THE PRR's INTO THE APESO SCHEDULES, WE HAVE ASKED THE PM's IN A SEPARATE LETTER TO PROVIDE THEIR PROJECTED PRR DATES.

## **ARMY PRR LESSONS LEARNED**

- EXPERIENCED PERSONNEL
- INDEPENDENCE OF TEAM
- QUESTION - ASKING VS. ANALYSIS
- SIZE OF PRR TEAM
- SINGLE VISIT VS. INCREMENTAL
- COOPERATION OF CONTRACTORS

## CONCLUSIONS

### ARMY PRR LESSONS LEARNED

AFTER HAVING CONDUCTED PRR's FOR 8 SYSTEMS IN THE ARMY, WE SEE THESE FACTORS AS BEING HIGHLY CONTRIBUTORY TO THEIR SUCCESS:

- THE USE OF PERSONNEL WITH EXPERIENCE IN PRIOR PRR's, PERHAPS WITH ANOTHER SYSTEM AS A TRAINING BASE, WITH EXPERTISE IN PRODUCTION STARTUP ACTIVITIES AND WITH POSITIVE, FORTHRIGHT ATTITUDES.
- THE TEAM SHOULD BE ABLE TO EXERCISE INDEPENDENCE OF JUDGMENT. IT IS PARTICULARLY IMPORTANT FOR THE TEAM CHIEF AND THE SUB-TEAM CHIEFS TO BE FROM OUTSIDE THE PMO. ON THE OTHER HAND, THE PMO PEOPLE SHOULD BE PARTICIPANTS NOT ONLY FOR THEIR SPECIALIZED KNOWLEDGE BUT TO TAKE IMMEDIATE ACTION ON PROBLEM AREAS.
- THE TEAM MEMBERS SHOULD DEVELOP DETAILED CRITERIA FOR THEIR OWN FUNCTIONAL AREAS. IN A NUMBER OF CASES, THIS PRIOR PREPARATION HAS NOT TAKEN PLACE, AND TEAM MEMBERS ARE SIMPLY GIVEN A LIST OF QUESTIONS TO ASK THE CONTRACTORS. THE EMPHASIS MUST BE PLACED ON ANALYSIS OF THE PRODUCTION READINESS ACTIVITIES.
- THE SIZE OF THE PRR TEAM SHOULD BE GEARED TO THE SIZE AND SCOPE OF THE PROGRAM, IN A STUDY CONDUCTED BY DOD IT WAS FOUND THAT THE RATIO OF CONTRACTOR PERSONNEL TO GOVERNMENT PERSONNEL INVOLVED IN THE PRR RANGED FROM 1.5 - 2. A LARGE TEAM

CAN BE A BURDEN NOT ONLY TO THE CONTRACTORS, BUT TO THE EFFECTIVENESS OF THE REVIEW AS WELL. ON THE OTHER HAND, THE TEAM MUST BE CAPABLE OF HANDLING ALL ASPECTS OF PRODUCTION READINESS - - 2 PERSONS TO A FUNCTIONAL AREA IS RECOMMENDED TO PRECLUDE OVERSIGHT OF PROBLEMS AND ENSURE INDEPENDENCE.

- IT IS EXTREMELY DIFFICULT TO ASSESS PRODUCTION READINESS IN A SINGLE VISIT TO A CONTRACTOR WITH A TEAM OF MANAGEABLE SIZE. INCREMENTAL VISITS THROUGHOUT ENGINEERING DEVELOPMENT DEVELOP THE CONFIDENCE THAT PRODUCTION STARTUP ACTIVITIES ARE ON SCHEDULE.
- FINALLY, COOPERATION OF CONTRACTORS CAN ONLY BE ASSURED IF THE REQUIREMENT FOR PRR's IS WRITTEN INTO THEIR CONTRACTS AT THE BEGINNING OF ENGINEERING DEVELOPMENT.



CONDUCTING INITIAL PRODUCTION READINESS REVIEWS (IPRR) and

PRODUCTION READINESS REVIEWS (PRR)

PRESENTED BY: LARRY KENNEDY

US ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND

DIRECTORATE FOR PROCUREMENT AND PRODUCTION

INDUSTRIAL MANAGEMENT AND PRODUCTION DIVISION (DRDAV-PI)

ST. LOUIS, MISSOURI 63120

## DoD Military Weapons Systems

### Preparation for and Conducting Initial Production

### Readiness Reviews and Production Readiness Reviews

#### I. Preparation for the IPRR/PRR

##### A. Selection of team members

1. Limit the team size to five or six members with multi-discipline experience, if possible.
2. Select team members with experience in areas and the type systems/subsystems to be reviewed.
3. Limit the team to one member (two for larger teams) from the PMO of the system being reviewed.
4. Plan for an advance team, consisting of the IPRR/PRR manager and another member of the team, to have a preliminary PRR meeting with PMO, the prime contractor, and the subcontractors initially selected to be visited.

##### B. The preliminary IPRR/PRR meeting

1. At this meeting, present to the PMO, prime contractor, and selected subcontractors the objectives, planning, methodology, and procedures to be used in conducting the Review at each contractor's site. Advise the contractors of the general type of information and validation being sought, the caliber of people that are on the team and that you expect to interface with the review team.
2. Develop, from this meeting, the list of parts/systems to be supplied by the prime and each subcontractor you plan to visit.
3. From the list and in the meeting determine the system complexity and potential depth of review necessary for each subcontractor. This list should also highlight the need for any special talent expertise that may be required on the review team to assess special technologies that may be encountered.
4. Establish and review, if any, the past history and experience of the PMO and prime contractor with each subcontractor for production of the same, similar or related parts or systems.

C. Selection of topics and areas to be reviewed in the IPRR/PRR

1. Develop for review at the prime contractor's and each subcontractor's facilities questions tailored to the specific type of operation, contract, and components or systems being supplied by the individual contractor. DODI 5000.38 can be used as a topic and general guide, but more pertinent questions should be developed for each type of plant.
2. Check with the in-plant government representative or office or responsible government contract administrative office for the past history and current experience of the contractor on government contracts or related commercial items.
3. Determine the programs/projects, and number of other related military and commercial contracts each contractor has scheduled for production during the same time frame the program under review is to be in planning and production.
4. Determine in the questions prepared for each contractor to be visited, the impact of concurrent production contracts, their relative priority ratings, schedules, and production equipment utilization requirements.

D. Establishing the agenda

1. Visits to contractors' plants should be planned by geographic areas - to maximize the time on-site and minimize travel time and cost.
2. Review time scheduled at each site should be in relation to the type of contract, production, and operation involved, e.g. a forging or casting facility producing parts to the prime contractor's specifications for rough finish and quality requires little time.
3. Submit the proposed questions, agenda and schedule to the PMO, prime contractor and other systems-suppliers (GFE PMOs and contractors) for comment and schedule coordination. The prime contractor should be given the subcontractor's questions and information for distribution to them and coordination of visits. Return comments on the submitted agenda and questions should be requested, if time permits.
4. Coordinating with the PMO and prime contractor allows adequate time in planning for contractors' comments and replies to be received and answered.

5. Review and revise IPRR/PRR questions, agenda, and schedules to reflect updated information gained during planning exchanges and programs history reviews. (This includes review of DoD files of the past performance history of the contractor on previous programs.)

## II. Conducting the IPRR/PRR

### A. Organizing the team effort

1. Have an initial assembly and briefing of the IPRR/PRR team at the program office describing the system and planned program.
2. Question the PMO staff as to problems, concerns, past problems resolved, schedules, long lead items, and program alternatives.
3. From the program office staff elements obtain assessments of the critical areas and risk factors.

### B. On-site reviews

1. The initial visit should be to the prime contractor's facilities. A briefing as to their status, their assessment of each sub-contractor and the overall status and interplay all elements of the program should be presented here. The final visit of the IPRR/PRR team also should be made to the prime contractor's facilities. This time, to determine if any changes are occurring and to advise the prime of the Review findings at the subcontractors and to inform them of any areas of concern.
2. At the prime's facilities, the team should receive an initial briefing from the DCASR or in-plant government representative office as to their assessment of the contractor's development progress and production preparedness. The final visit to the prime contractor should provide for an update by the government representative as to any changes, corrections or schedule revisions that may have resulted from test failures or other problems that may have developed.
3. Visits to the prime and subcontractors should, following instructions, be kicked-off with questioning of the contractor as to any problems encountered with the submitted questions. This, followed by a brief presentation of the company's organization, operations, and part in the program being reviewed, eliminates a later discovery that they are not really prepared to present the material and information needed.

4. A plant tour of those facilities that are to be utilized or will support production related to the reviewed system is desirable. The tours should be tailored to cover the specific program production equipment and related operations.
5. The team review at each site should endeavor to cover all elements of the topics of the IPRR/PRR related to that contractor. The questions submitted to the contractors in advance of the visits are to serve as openers only and should lead the reviewing team members into other and deeper questions as topics and areas of concern are revealed.
6. Encouragement to fellow team members to look into areas of question/concern which may give cause or evidence of a problem in other areas is a necessary element of team crossfeed during the review.

#### C. Completing the job

1. A wrap-up visit to the prime contractor and to the PMO should be the final visits in the reviews. Even these visits should be a two way exchange. The PMO should be presented the preliminary report findings of the review team for use in developing action items to be pursued prior to DSARC. The PMO should also inform the review team of any problems or areas of concern that they are aware of and any actions taken to resolve them.
2. Similarly, the final review of the prime contractor's plant should inform them of the problems/concerns found by the Review team and give them opportunity to initiate corrective actions prior to final formulation of the IPRR/PRR report. The contractor should be questioned at this time as to any outstanding actions scheduled to be completed prior to preparation and submittal of the final report. This meeting should also produce a checklist of the data items the contractor still needs to provide the Review Team and any open items yet to be reviewed or reports are due on.

### III. The IPRR/PRR Report

- A. Format - The remaining part of the review effort is preparation of the report which will vary by service and command preference for which usually the format is prescribed.
- B. Report Essentials
  1. Essential to a good report is documenting the program areas of weakness and concern found in the Review.

2. Actions planned by the PMO and the contractors to correct these problems should also be reported.
3. Risk areas and the contributing factors should be headlined with realistic assessments of their impacts on the program's production.
4. Any incomplete reports, tests, or data denied or determined inaccessible should be noted.
5. Above all the report should represent the unified findings and opinions of the IPRR/PRR team members.



CH-47 MODERNIZATION  
PRODUCTION READINESS  
REVIEW PLAN

Presented by: LARRY KENNEDY  
US Army Aviation Research and  
Development Command  
Directorate for Procurement and  
Production  
Industrial Management/Production  
Division (DRDAV-PI)  
St. Louis, MO 63120



INITIAL PRODUCTION READINESS REVIEW  
(IPPR)

THE FOLLOWING REGULATIONS ESTABLISH THE CRITERIA FOR IPRRS AND PRRS:

- A. ARMY PRODUCTION READINESS REVIEW REGULATION 70 - 67, 1 DEC 79
- B. DOD 5000.1, MAJOR SYSTEM ACQUISITION, 18 JAN 77
- C. DOD 5000.2, MAJOR SYSTEM ACQUISITION PROCESS, 18 JAN 77
- D. DOD 5000.34, DEFENSE PRODUCTION MANAGEMENT, 31 OCT 77
- E. DODI 5000.38, PRODUCTION READINESS REVIEWS, 24 JAN 79

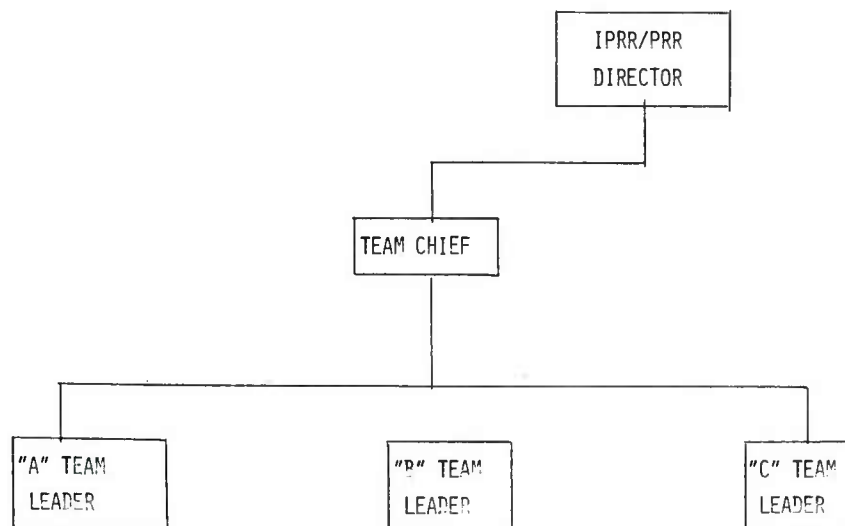


#### EXAMPLES OF PRODUCTION READINESS CRITERIA

- LOW RISK PRODUCT DESIGN IN TERMS OF PRODUCIBILITY
- ECP ACTIVITY HAS STABILIZED AT A LOW LEVEL
- TECHNICAL DATA PACKAGE IS COMPLETE/PROPRIETARY ITEMS ARE KNOWN
- COMPATABILITY OF PRIME/VENDOR PRODUCTION SCHEDULES WITH END ITEM DELIVERY SCHEDULE
- CRITICAL/SCARCE MATERIALS USED ONLY WHERE DICTATED
- COMPREHENSIVE MANUFACTURING PLAN DEVELOPED
- VALUE ENGINEERING AND QUALITY PROGRAMS DEVELOPED



#### PRODUCTION READINESS REVIEW ORGANIZATION





## PRODUCTION READINESS REVIEW - INNOVATIONS

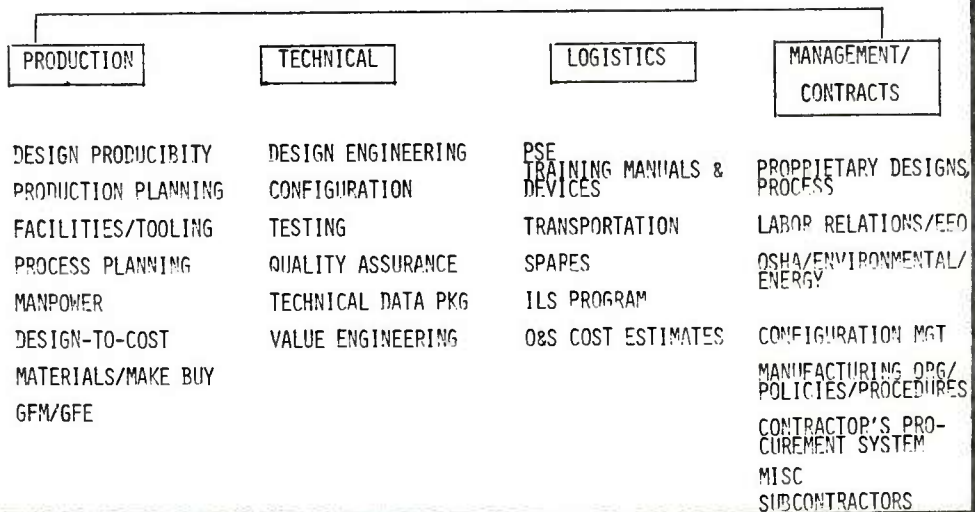
### INITIAL PRODUCTION READINESS REVIEWS

● LEVEL "A" CONTRACTOR	PRODUCTION TECHNICAL LOGISTICS MGT/CONTRACT
● LEVEL "B" CONTRACTOR	PRODUCTION TECHNICAL MGT/CONTRACT
● LEVEL "C" CONTRACTOR	PRODUCTION TECHNICAL



## CH-47 MOD PROGRAM IPRR/PRR REVIEW AREAS

TEAM CHIEF





#### DECISIONS AFFECTED BY PRR

##### PRIMARILY:

- ASARC III
- DSARC III
- AND, ULTIMATELY, THE SECDEF'S DECISION



#### CH-47 INITIAL PRODUCTION READINESS

#### AND FORMAL PRODUCTION READINESS REVIEWS

- INITIAL MEETING WITH BOEING-VERTOL
  - PURPOSE
  - SCOPE
  - ESTABLISH SUBCONTRACTORS SCHEDULE
- LIST OF BOEING SUBCONTRACTORS
  - HONEYWELL CORPORATION (IPRR).....7 - 8 AUG 79
  - RONSON HYDRAULIC UNITS CORPORATION (IPRR).....9 - 10 AUG 79
  - RONSON HYDRAULIC UNITS CORPORATION (PRR).....10 - 11



CH-47 INITIAL PRODUCTION READINESS

AND FORMAL PRODUCTION READINESS REVIEWS (CONTINUED)

WYMAN GORDON CORPORATION (PRR).....14 - 15 AUG 79  
FEEN MANUFACTURING COMPANY (PRR).....21 - 22 AUG 79  
LITTON PRECISION GEAR (IPRR).....28 - 29 AUG 79  
LITTON PRECISION GEAR (PRR).....26 MAR 80  
AVCO LYCOMING (IPRR) GFM.....15 - 18 OCT 79  
AVCO LYCOMING (PRR INTERIM) GFM.....15 - 18 APR 80  
AVCO LYCOMING (FINAL PRR) GFM.....18 JUN 80



CH-47 INITIAL PRODUCTION READINESS

AND FORMAL PRODUCTION READINESS REVIEWS (CONTINUED)

BOEING VERTOL (IPRR).....1 - 5 OCT 79  
BOEING VERTOL (PRR).....29 - 2 MAY 80  
AIRCRAFT POROUS MEDIA INC. (PRR).....4 - 6 FEB 80  
NEW YORK AIR BRAKE (PRR).....13 - 15 FEB 80  
LADISH PACIFIC COMPANY (PRR).....12 - 13 MAR 80  
SUNDSTRAND CORPORATION (PRR).....24 - 26 MAR 80  
TURBOMACH (PRR) GFM.....29 - 2 JUL 80



**COPPERHEAD  
PRODUCTION READINESS REVIEW**

**LESSONS LEARNED**

**PRESENTED BY  
JIM PRITCHARD**

TITLE CHART

GOOD AFTERNOON:

IT IS INDEED A PLEASURE TO BE HERE TODAY TO TALK ABOUT MY EXPERIENCES ON THE COPPERHEAD PRODUCTION READINESS REVIEW. I MIGHT ALSO ADD THAT I AM CONVINCED AS TO THE VALUE OF THE PRR AND THINK THAT THIS CONFERENCE, WHICH IS CONCERNED WITH IMPROVING PRR'S, IS AN EXCELLENT EFFORT.

## OUTLINE

- BACKGROUND
- PRR PHASES
- PLANNING
- FOLLOW-UP
- "LOOKING BACK"
- SUMMARY

### OUTLINE CHART

SHOWN HERE IS AN OUTLINE OF MY PRESENTATION. FIRST I WOULD LIKE TO GIVE A LITTLE BACKGROUND ON THE ITEM, FACILITIES, AND THE PRR. THEN I WILL DISCUSS THE THREE PHASES OF THE PRR, A DISCUSSION ON PLANNING, IMPORTANCE AND VALUE OF FOLLOW-UP , A LOOK BACK AT OUR PRR, AND SOME SUMMARY REMARKS.

## PRR SCHEDULE

INITIAL PRR (DARCOM)	DECEMBER 18, 1978
PRR (AT CONTRACTOR)	MARCH 7-9, 1979
PRR UPDATE (AT CONTRACTOR)	MAY 2, 1979
PRR UPDATE (AT ARRADCOM)	MAY 29, 1979
PRR UPDATE (AT DARCOM)	JUNE 30, 1979

### PRR SCHEDULE CHART

SHOWN ON THIS CHART IS OUR PRR SCHEDULE, OUR MAIN PRR WAS HELD A YEAR AND A HALF AGO WITH THREE (3) SUBSEQUENT UPDATES.

## THE ITEM

- 155MM PROJECTILE
- LASER GUIDED
- HARDENED ELECTRONICS
- SHAPED CHARGE WARHEAD
- CONTRACTOR: MARTIN MARIETTA  
AEROSPACE

### THE ITEM CHART

THE COPPERHEAD IS A SNAKE BUT WHAT WE ARE CONCERNED ABOUT IN THIS DISCUSSION IS A 155MM PROJECTILE WHICH IS SHOT FROM A HOWITZER AND IS LASER GUIDED TO THE TARGET BY MEANS OF A DESIGNATOR. IN ORDER TO PERFORM ITS FUNCTION, THE ELECTRONICS PACKAGE ASSOCIATED WITH GUIDANCE AND CONTROL HAD TO BE HARDENED IN ORDER TO SURVIVE THE 10,000 G GUN LAUNCH ENVIRONMENT. THE ROUND CONTAINS A SHAPED CHARGE WARHEAD CONTAINING COMPOSITION B EXPLOSIVE. PRIME CONTRACTOR IS MARTIN MARIETTA AEROSPACE CORPORATION, ORLANDO, FLORIDA WHO WAS SELECTED AS THE RESULT OF A SHOOT-OFF DURING ADVANCE DEVELOPMENT. IN ADDITION TO MARTIN, THERE ARE FIVE MAJOR SUBCONTRACTORS. LOADING IS DONE BY IOWA IAAP.

# THE PROCESS

## PRIME CONTRACTOR

- ELECTRONICS ASSEMBLY & TEST
- METAL WORKING
- OPTICS
- GYRO

## SUBCONTRACTORS

- FUZING
- LSI'S
- CONTROL SYSTEM
- ROLL RATE SENSOR
- BATTERY

## 2ND TIER VENDORS

- ELECTRONIC
- MECHANICAL

## GOVERNMENT LOADING

### THE PROCESS CHART

CONTINUING TO GIVE MORE BACKGROUND ON THE PRR, THIS CHART INDICATES SOME OF THE CHARACTERISTICS OF THE PROCESS. THE PRIME CONTRACTOR'S EFFORT IS BASICALLY ELECTRONICS SUB-ASSEMBLY, ASSEMBLY, TEST AND FABRICATION. IN ADDITION HE MACHINES THE PROJECTILE HOUSINGS. IN ADDITION HE HAS SET UP A NUMBER OF SPECIALIZED MODULES FABRICATING OPTICS, GYROS, AND COILS. PRIME SUBCONTRACTORS ARE INVOLVED WITH FUZE, LARGE SCALE INTEGRATED CIRCUITS, FLIGHT CONTROL SYSTEMS, ROLL RATE SENSORS, AND A BATTERY. BEYOND THE SUBCONTRACTORS ARE THE 2ND TIER VENDORS SUPPLYING THE PRIMARLY ELECTRONIC AND MECHANICAL COMPONENTS. IOWA ARMY AMMUNITION PLANT LOADS OUR WARHEAD.

## PRR PHASES

- PLANNING
- THE PRR
- FOLLOW-UP

### PRR PHASES CHART

NOW THAT I HAVE GIVEN YOU A LITTLE BACKGROUND ON OUR ITEM, AND PRR, LET ME GIVE YOU SOME OF MY OBSERVATIONS.

I CONSIDER THE PRR TO BE IN THREE PHASES AS SHOWN ON THIS CHART. THE PLANNING PHASE WHICH PROCEEDS THE ACTUAL PRR, THE PRR ITSELF, AND PRR FOLLOW-UP. I WILL DEVOTE MOST OF MY REMARKS TO THE FIRST AND LAST PHASES SINCE I CONSIDER THEM TO BE EXTREMELY IMPORTANT.

## PLANNING

- FORMATION OF PLANNING GROUP
- COORDINATION WITH CONTRACTOR
- DETERMINATION OF NEEDS ✓
- DEVELOPMENT OF ORGANIZATION
- IDENTIFICATION OF PERSONNEL
- SELECTION OF PERSONNEL ✓
- TRAINING OF PERSONNEL ✓

### PLANNING CHART

ON THIS CHART I'VE SHOWN SOME OF THE MAJOR STEPS IN THE PLANNING STAGE AND WOULD LIKE TO DISCUSS THE CHECKED ITEMS. IT IS DIFFICULT TO PLAN PROPERLY IF A THOROUGH DETERMINATION OF NEEDS IS NOT MADE. IN OUR CASE, A BROAD SPECTRUM OF DIVERSE TECHNOLOGIES NECESSITATED A WIDE RANGE OF INDIVIDUAL SKILLS IN ORDER TO PERFORM THE PRR.

SELECTION OF THE RIGHT PEOPLE IS THE MOST IMPORTANT PLANNING FUNCTION. OUR EXPERIENCE HAS SHOWN THAT YOU SHOULD EXHIBIT MOST DEMANDING PERSISTENCE IN YOUR SEARCH AND SELECTION OF THE RIGHT PEOPLE. AFTER FINDING THEM, THEY SHOULD BE TRAINED, IF NOT FAMILIAR WITH, THE PRR PROCESS.

## **FOLLOW-UP**

- **PRR IS A CONTINUING FUNCTION**
- **ACTIONS ARE INITIATED: NEED FOLLOW-UP**
- **UTILIZE THE SKILLS AVAILABLE**
- **"KEEP THE PRESSURE ON"**

### FOLLOW-UP CHART

LEAPING OVER THE PRR FROM THE PLANNING STAGE INTO THE FOLLOW-UP, THIS CHART DISPLAYS SOME OF THE KEY POINTS OF THIS PHASE. PRR IS AN INVESTMENT - IT IS A CONTINUING FUNCTION. ACTIONS ARE IDENTIFIED, INITIATED, BUT NEED FOLLOW-UP. SOME OF THE SKILLS WHICH HAVE BEEN ASSEMBLED CAN BE USED ALSO IN A FOLLOW-UP MODE. THE KEY IS KEEP THE PRESSURE ON - GAIN THE BENEFITS OF THE PRR.

## **"LOOKING BACK"**

- RAN OUT OF TIME
- PRR COULD BE DONE IN 2 1/2 DAYS
- MOST ASSUMPTIONS/CONCERNS WERE VALID
- EXPERIENCE CAN IMPROVE

### "LOOKING BACK" CHART

LOOKING BACK AT OUR PRR IT SEEMED AS IF WE JUST RAN OUT OF TIME IN THE PLANNING STAGE. AS WE WERE GETTING THE ENTIRE PRR TEAM UP TO SPEED THE BIG DAY WAS UPON US. ADDITIONAL TIME WOULD HAVE BEEN VALUABLE - MORAL HERE - BUDGET AND PLAN TIME.

I WAS VERY SKEPTICAL THAT WE COULD DO WHAT WE HAD TO DO IN ONLY 2½ DAYS. I WAS QUITE PLEASANTLY SUPRISED THAT WE DID A DECENT JOB IN THAT TIME FRAME. MORAL HERE IS TO DO WHAT YOU CAN AHEAD OF TIME - ACTUAL PRR TIME IS GOLDEN.

A MOST REASSURING FACT WAS THAT MOST ASSUMPTIONS MADE AND CONCERNS DID PROVE VALID. A GOOD ANALYSIS WAS MADE.

BOTTOM LINE IS THAT BASED ON OUR EXPERIENCE WE COULD IMPROVE OVER WHAT WE FELT WAS A GOOD PRR.

# SUMMARY

- PLAN CAREFULLY
- GET THE RIGHT PEOPLE
- TRAINING
- FOLLOW-UP

## SUMMARY CHART

IN SUMMARY, OUR EXPERIENCE HAS SHOWN YOU SHOULD PLAN VERY CAREFULLY AND VERY EARLY - IT ALWAYS SEEMS THERE IS NOT ENOUGH TIME LEFT BEFORE THE PRR. PEOPLE ARE THE KEY TO SUCCESS FOR THE PRR - DETERMINE THE NEEDS, SEARCH OUT THE RIGHT PEOPLE, AND "LAND" THEM. TRAIN PEOPLE FOR THE PRR, YOUR PRR, YOUR ITEM, IF THEY ARE NOT KNOWLEDGEABLE IN THESE AREAS. SAVE THE "GOLDEN TIME" OF THE ACTUAL PRR FOR WHAT IS ESSENTIAL - CERTAINLY NOT TRAINING THAT COULD BE DONE AHEAD OF TIME.

# AAH PRODUCTION READINESS REVIEW PLAN



2472

## PRODUCTION READINESS REVIEW AGENDA

ANTHONY PIAZZA

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- INTRODUCTION AND ORIENTATION
- IPRR/PRR OVERVIEW
  - IPRR/PRR DEFINITIONS
  - IPRR/PRR SCHEDULES
- AAH PRR APPROACH
- TEAM ORGANIZATION
- AREAS OF REVIEW

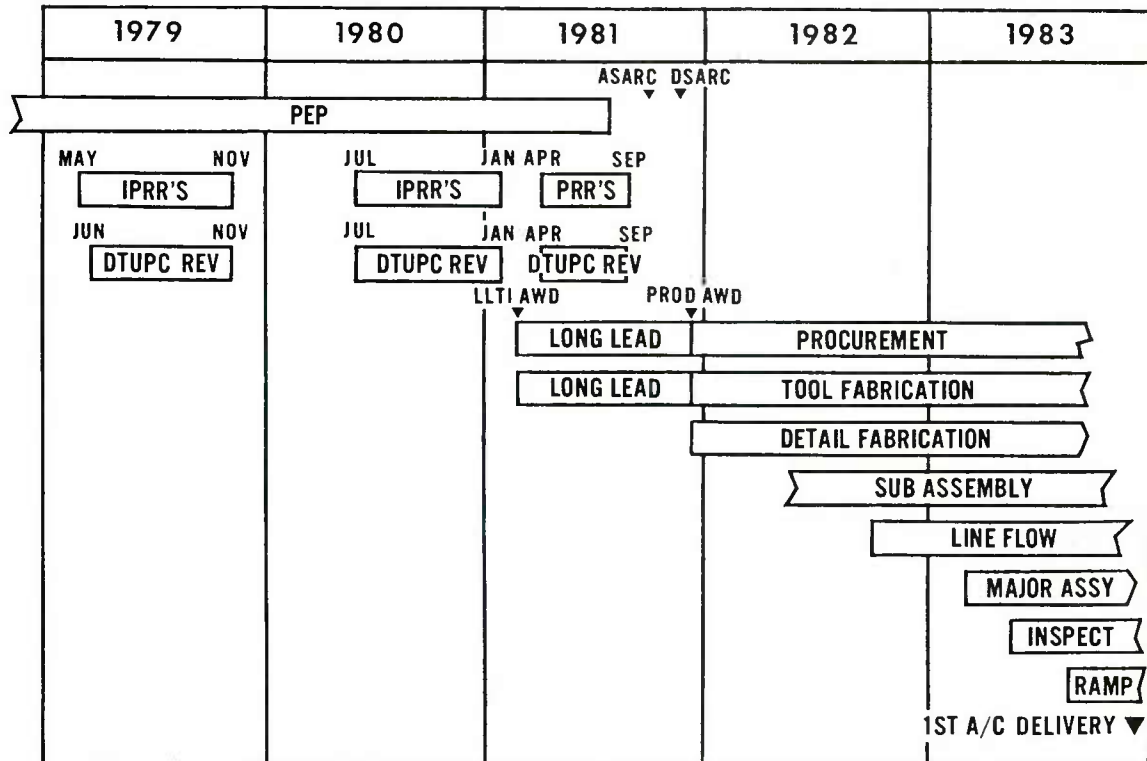
2474

# INITIAL PRODUCTION READINESS REVIEW (IPRR) AGENDA

- INDIVIDUAL FUNCTIONAL TEAM CAPTAIN MEETINGS
  - DISCUSS CRITERIA
  - DISCUSS REQUIRED EVIDENCES
  - REVIEW CURRENT STATUS/AVAILABLE DATA/PROBLEM AREAS
- EXIT INTERVIEW
  - AREAS OF CONCERN
  - GUIDANCE/REQUIRED DATA FOR PRR

2481

## AAH PRODUCTION TRANSITION



## PRR MILESTONES

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IPRR PERFORMANCE.....APR - SEP 79  
IPRR COMPLETE.....1 NOV 79  
INPRR PERFORMANCE.....AUG 80  
INPRR COMPLETED.....JAN 81  
PRR PERFORMANCE.....APR - JUL 81  
PRR COMPLETE.....1 SEP 81  
ASARC III.....15 NOV 81  
DSARC III.....5 DEC 81  
PRODUCTION AWARD.....10 DEC 81

2473

## TRANSITIONING TO PRODUCTION

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- REVIEW OF BLACK HAWK PRODUCTION EXPERIENCE
  - DETERMINE LESSONS LEARNED
- SIGNIFICANT PEP EFFORT CURRENTLY IN BEING
  - MASTER PROGRAM AND PRODUCTION SCHEDULES COMPLETED
  - COMPREHENSIVE PRODUCTION PLAN UNDER DEVELOPMENT
  - IN-HOUSE PRODUCTION DRAWINGS APPROXIMATELY 60% COMPLETE
  - TOOL DESIGN APPROXIMATELY 32% COMPLETE
- CONTRACTOR FACILITIZATION PLANS TO MEET PRODUCTION DELIVERY SCHEDULE
  - FACILITY PLANS TOTALING APPROXIMATELY \$50M BEING IMPLEMENTED AND ACHIEVEMENTS RIGOROUSLY MONITORED

2475

## TRANSITIONING TO PRODUCTION (CONT'D)

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- **EARLY SELECTION AND PLACEMENT OF KEY MEMBERS OF CONTRACTOR'S PRODUCTION TEAM**
  - **KEY MEMBERS SELECTED OR TO BE SELECTED IN THE NEAR FUTURE**
- **PRODUCTION READINESS REVIEWS (PRRs)**
  - **INITIAL PRODUCTION READINESS REVIEWS CONDUCTED IN CY 79**
  - **SELECTED INTERMEDIATE PRRs CURRENTLY BEING CONDUCTED**
  - **FINAL PRRs SCHEDULED APR THRU SEP 81**
  - **DA AND DOD PESO PARTICIPATION**
- **PRODUCTION SCHEDULE COMPATIBLE WITH END ITEM DELIVERY REQUIREMENTS**
  - **LLTI/IPF REQUIREMENTS IDENTIFIED AND BUDGETED (34 MONTH PLT)**

2480

DECISIONS AFFECTED BY PRR

PRIMARILY:

- ASARC III
- DSARC III
- AND, ULTIMATELY, THE SECDEF'S DECISION

# PRODUCTION LESSONS LEARNED

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## WHAT WE LEARNED FROM BLACK HAWK

- PRODUCTION LEADTIME TOO SHORT (20 MONTHS)
- LATE IDENTIFICATION OF LLTI
- LATE INITIATION OF PEP
- MINIMUM PRODUCTION READINESS VERIFICATION ACCOMPLISHED PRIOR TO PRODUCTION AWARD
- MANUFACTURING PLANNING/ FACILITIZATION ACCOMPLISHED CONCURRENT W/INITIAL PRODUCTION
- LATE COMPLETION OF DESIGN AND QUALIFICATION

## WHAT AAH HAS DONE/WILL DO DIFFERENT

- PRODUCTION LEADTIME REVISED FROM 25 TO 34 MONTHS IN EARLY 79
- EARLY IDENTIFICATION AND BUDGET FOR LLTI
- PEP INITIATED CONCURRENT WITH START OF PHASE 2
- PROGRESSIVE PRODUCTION READINESS REVIEWS ON PRIMES & ALL MAJOR SUBCONTRACTORS
- MANUFACTURING & FACILITIES PLANS IDENTIFIED EARLY AND RIGOROUSLY MONITORED (QUARTERLY PRODUCTION AND FACILITIES PLAN)
- CLOSELY MONITOR DESIGN AND QUALIFICATION EFFORT

2476

## INTERMEDIATE PRODUCTION READINESS REVIEW (IN-PRR) AGENDA

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IT IS A FORMAL EXAMINATION OF PROGRAM  
TO DETERMINE:

- IF THE LONG LEAD ITEMS DESIGN IS  
READY FOR PRODUCTION
- LEVEL OF PRODUCTION ENGINEER  
PROBLEMS (BENCH MARK)
- STATUS OF PLANNING

2477

## PRODUCIBILITY SUMMARY

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- **BLACKHAWK PRODUCTION PROBLEMS REVIEWED FOR "LESSONS LEARNED"**
- **PEP EFFORT IN BEING AT HUGHES, MARTIN & MAJOR SUBCONTRACTORS**
- **PRODUCTION READINESS/DTUPC REVIEWS IN PROGRESS**
- **LLTIs IDENTIFIED AND BUDGETED**

2478

### PRR SCHEDULE

<u>CONTRACTOR</u>	<u>SUBSYSTEM COMPONENT</u>
ASD	ROTOR BLADES
BERTEA	HYDRAULICS
SPERRY	ASE SYMBOLOGY GENERATOR MULTIPLEX
GARRETT AIRESEARCH	APU
TELEDYNE SYSTEMS	FIRE CONTROL COMPUTER
ROCKWELL INTERNATIONAL	HELLFIRE
LITTON GUIDANCE	HARS
BENDIX	DRIVE SHAFTS COUPLING
A/C GEAR	INTERMEDIATE AND T/R GEARBOXES
LITTON	TRANSMISSION NOST GEARBOXES

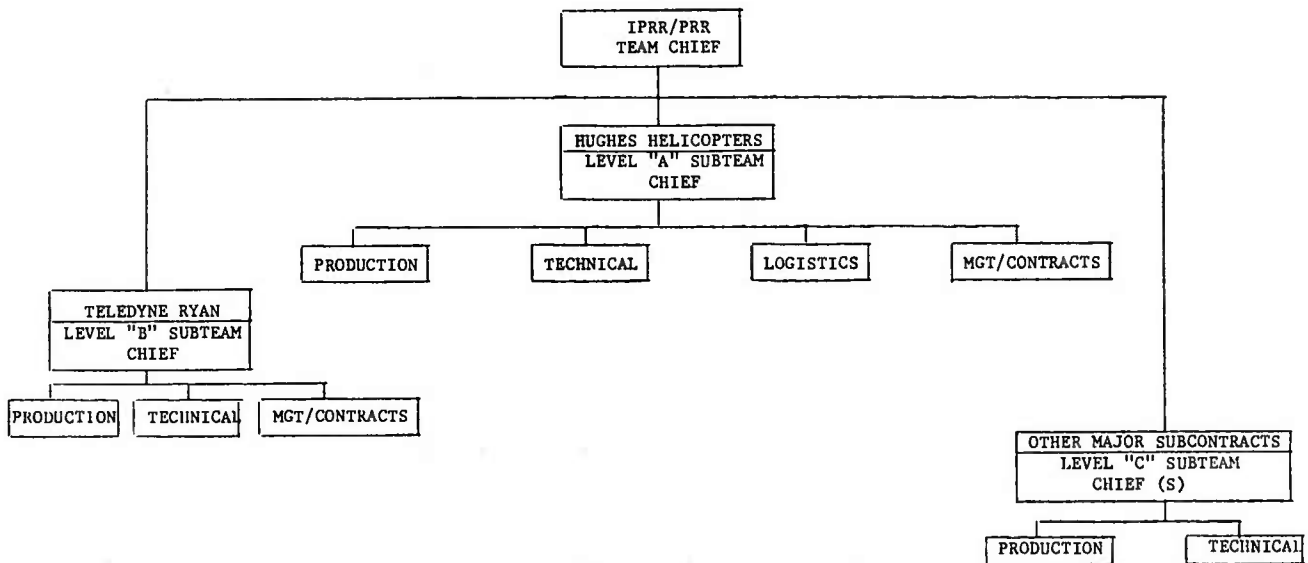
## PRR SCHEDULE

<u>CONTRACTOR</u>	<u>SUBSYSTEM/COMPONENT</u>
TELEDYNE RYAN	FUSELAGE
ILS	LASER
MARTIN MARIETTA	TADS/PNVS
MENASCO	LANDING GEAR
HONEYWELL	THADSS
RCA	AIE
HUGHES	AAH
GARRET AIRESEARCH (CA)	IPAS
REPORT COMPLETE	

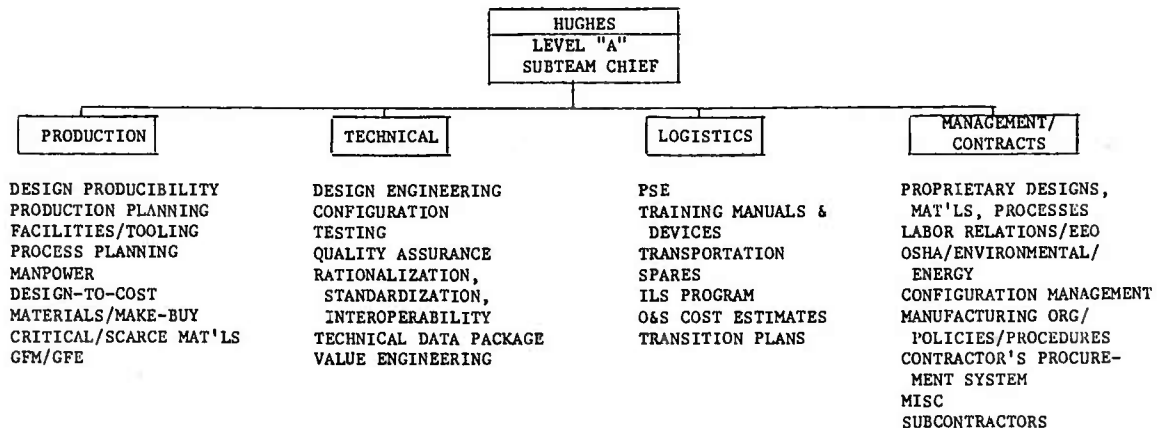
### AAH WEAPONS SYSTEM PROPOSED PRR APPROACH

- MULTI-TIERED TEAM APPROACH
  - HUGHES
  - TELEDYNE RYAN
  - OTHER MAJOR SUBCONTRACTORS
- CONSOLIDATED PRR REPORT FOR ASARC III/DSARC III ADDRESSING AAH AS AN INTEGRAL SYSTEM

# IPRR/PRR TEAM ORGANIZATION



## IPRR/PRR REVIEW AREAS (EXAMPLE - LEVEL "A")



#### EXAMPLE OF PRODUCTION READINESS CRITERIA

- LOW RISK PRODUCT DESIGN IN TERMS OF PRODUCIBILITY
- ECP ACTIVITY HAS STABILIZED AT A LOW LEVEL
- TECHNICAL DATA PACKAGE IS COMPLETE
- LONG LEAD ITEMS ORDERED
- CRITICAL/SCARCE MATERIALS USED ONLY WHERE DICTATED
- COMPREHENSIVE MANUFACTURING PLAN DEVELOPED
- PRODUCTION SCHEDULES COMPATIBLE WITH DELIVERY REQUIREMENTS
- VALUE ENGINEERING AND QUALITY PROGRAMS DEVELOPED



## PLANNING MICOM'S PRODUCTION READINESS REVIEWS

HAROLD G. PEACOCK  
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Redstone Arsenal, AL 35898

### ABSTRACT

Production planning must take place during Engineering Development (ED). The Production Readiness Review process has been developed to assure that this planning takes place and to identify weaknesses and problems in the production planning. Planning the PRR is just as critical as planning for production. Areas covered in planning the Missile Command's Production Readiness Reviews include selecting team personnel, training personnel, developing team work packages, structuring team activity, and, finally, establishing a communication network. This planning effort includes coordinating all activities with the supporting contractors and major suppliers.

### I. INTRODUCTION

A. Background. Production Readiness Reviews are required by DoD Directive 5000.34 and AR 70-67 with instructions provided by DoD Instruction 5000.38. MICOM Regulation 70-33 places the MICOM focal point for conducting PRRs in the Production Engineering Division - a division within the System Engineering Directorate. This division usually provides the PRR chairman, PRR coordinator, and Producibility Engineering and Planning (PEP) panel leader and some PEP members. The remaining panel leaders and team members come from the other MICOM directorates, such as Product Assurance, Guidance and Control, Propulsion, and other directorates as required. Obtaining assistance from the various MICOM directorates requires support at the Command level and at the Project Management level. MICOM has made the commitment and enforces its policy through MICOMR 70-33 which formalizes a total commitment to DoD Directive 5000.34 and AR 70-67.

B. General. The PRR usually starts in the early stages of Engineering Development (ED) and reviews the producibility and production planning which must begin early in order that technical and economic considerations can be given to the product manufactured. As the product development progressively matures, the development tasks are identified and planned for PRR review such as design finalization and verification, parts identification and qualification, and producibility and manufacturing technology assessments. Later, selection and design tasks are identified in manufacturing areas such as equipment, tooling, test equipment, plant layout, design maturity, tool qualification, and logistic considerations. Still later, production tasks are accomplished such as developing the process paper, proofing specific manufacturing processes and equipment, initial production facilities development, manufacturing information systems and reports identification, and long lead procurement planning. Planning for the PRR, therefore, is very critical since the purpose of the PRR is to insure planning for production is complete.

### II. PLANNING MICOM PRODUCTION READINESS REVIEWS (PRRs)

A. Project PRR Plan. The first step in planning the MICOM PRR is the preparation of the basic requirements for a project PRR. This plan is prepared by the PRR chairman, coordinator, and staff personnel of the Production Engineering Division,

whose responsibility is to provide production engineering services as technical agents to the Program Manager. The formal plan is required by AR 70-67 sixty days prior to the first or Initial Production Readiness Review (IPRR). As a minimum, this plan identifies the product, the contractors and suppliers where a review will be performed, and a tentative schedule for these reviews. Special or unique requirements are also identified. The plan does not inhibit adding or excluding a subcontractor or supplier to the schedule. Next, the plan is approved by the Product Project Manager. The plan is then submitted to APESO at DARCOM for review. Lastly, the plan is coordinated with the contractors for their information and contribution.

The plan is coordinated depending upon the product, contractors, and the existing contract. On one occasion it was necessary to scope a task and contract for the required PRR contractor support. This example proved to achieve a more cost effective and efficient review. PRR team size was restricted to approximately 12 members in four panels. Production documentation was limited, as it should be, to existing data. Contractor personnel involvement was to transmit information directly rather than to prepare extensive briefings with a significant number of "dry runs" and top level massaging. It was brief, to the point, and more representative of existing conditions.

B. Team Personnel. The next planning task which must be accomplished is personnel selection. The Production Engineering Division coordinates the selections of team members and obtains agreements from the members and their supervisors prior to requesting personnel assignment by members and their supervisors prior to requesting personnel assignment by the MICOM Chief of Staff. Individuals are selected based upon their potential to contribute to an independently and objectively conducted review. Team personnel are chosen after evaluating the following personal factors: experience, education, communication skill, personality traits, and job position. Therefore, member candidates are identified based upon these specific elements, the product and upon the contractor/facilities involved.

1. Experience. The team experience must be given the proper mix, e.g., propulsion, explosives, safety, guidance and control, logistics and manufacturing.

2. Education. Education provides technical knowledge which allows overlapping in technical areas where a fresh viewpoint can be beneficially expressed. Expertise is based upon technical training as well as experience and both are necessary to establish credibility.

3. Communication skills. Each member will be required to exchange information, the team members formulating a line of questioning that will extract desired information while maintaining a pleasant contractor working relationship. An open discussion environment is critical; neither party should "play games." The reviewer must know what is important and how to express it.

4. Personality Traits. The personality traits include attitude, confidence in ability, dress, and cooperativeness. These traits will determine the effectiveness of implementing education and experience characteristics. Let us examine these traits one by one.

- a. If one's attitude toward either the PRR, program, or contractor is not one of willingness to constructively contribute, then that individual should be excluded from serving on the PRR team.

- b. Confidence is very important. Adequate planning, training, and experience in these reviews will increase confidence in one's ability.

c. First impressions are important in establishing each member's status in the eyes of others. It is important that the contractor personnel know that they are briefing "key" and "important" personnel; proper dress enhances this impression.

d. Cooperation with other team members and contractor personnel is needed to insure successful review. Exchanges of observation, clarification of objectives and procedures, and willingness to take on unpleasant tasks are necessary for a beneficial Production Readiness Review. The team is staffed from the various directorates at MICOM which specialize in the major technologies required to develop Army missile systems. Once the potential PRR members have been identified, they and their supervisors are contacted. Tentative PRR schedules are proposed and coordinated.

C. Team Training. Training team members takes the form of conducting several meetings where experienced PRR participants speak on review "how to" techniques, lessons learned, experiences with the manufacturer to be visited, when possible, and briefing by the laboratory and project office personnel. These meetings are scheduled to provide time for detail discussion by the prospective PRR team members. The meetings are used to explain the PRR working techniques, schedules, working packages, and reporting/writing. Many members have never served on a PRR team. Engineers are asked to become investigative analysts, a role new to most engineers; however, they must have the courage and confidence for face-to-face confrontation - many people the PRR members confronted will become emotional, others will not answer the question you think you are asking (they use a play on words); therefore, you must make sure you understand the answer given. Ask for proof, repeat their answer the way you understand it, record significant findings and the name of the company representative giving the information. Know your product, your company, and the information desired. Always place the responsibility to demonstrate readiness upon the contractor. The purpose of training is to inform each team member on what to expect. It must also cover techniques and use of PRR forms if PRR goals are to be adequately accomplished. Training must let the team member know what is required of him technically and in proper personal conduct. Nothing destroys respect for the team quicker than a member being inattentive during a contractor briefing --get up and take a break or take notes. Chances are the notes will be useful in documenting a finding or will start the investigator on the tail of a concern.

Training the team is the most positive way to assure an efficient PRR. In addition to building self-confidence, training instills cooperation within the team including contractor personnel. Training also improves the level or value of recommendations from the team. Of course, training does not give technical expertise but it does show the capability to implement the expertise.

D. Work Packages. Work packages are developed from a standard MICOM PRR instruction. The purpose of the work package is to make it easier to finalize the findings by developing a standard format for all panels and members. These forms will vary from project to project but will remain standard with a specified project. This instruction defines PRR objectives, establishes PRR structure, and sets general scopes and limits in each functional area. Each functional area is then tailored to the specific product, contractors, and reviewing team. The tailoring information generally comes from technical reviews, reports, and briefings on the project. Other information sources include the DCP, RFP, and the development plan. The work packages are provided the members at an early training session and the panel leader is requested to suggest tailoring by adding special interest areas.

Working forms such as Request for Information, Areas of Concerns (AOC), Unsatisfactory Findings (UF), and panel report outlines are tailored to be compatible with

the production development and PRR review status. For instance, the AOC form is used in the first stages and changed to an unsatisfactory finding form in the last stages. The use and purpose of each form is discussed thoroughly during the training sessions.

E. Structure. Perhaps structuring the PRR is the most important area of planning production review. Structuring the review effort involves the following factors: scheduled events, job descriptions, resources, and travel requirements. First, scheduling the events serves to plan each day in detail from the daily start-up meeting to the afternoon close-out meeting. The start-up meeting serves to provide general administrative details and assures members are present. The close-out meeting must include the panel leaders and on small teams or where there is confusion, all the team members should be invited. This government-only meeting assures cooperation and information exchange, including problem discussions. After the government-only meeting, the PRR Chairman and coordinator should meet with the contractor representative to establish splinter or panel meetings, clarify information needs, and solve any problems between the PRR team member and contractor personnel. Second, a job description does not necessarily need to be formal; however, it is necessary for each member to clearly understand what is expected of them. This understanding must include daily activity toward their area of responsibility and to other panels, interaction in the PRR team, and in reporting areas of concern and final report. Third, available resources must be planned and are necessary to complete an effective review. These resources include areas for panel meetings, existing data, a listing of data in each subject area, and contractor support or one-on-one or panel discussion. Ask the contractor for an overview of listing of acronyms and briefing vignettes in advance. Fourth, identify the choices of travel, the motels and their cost, and try to identify personnel for car sharing purposes. Generate a personnel list and provide adequate time for introductions and getting acquainted during the training meetings. Remember, on-site overview and other team meetings must be designed to optimize the effort while leaving ample time for individual and panel activity. The structured agenda aids in eliminating confusion, developing team unity, and identifying data requested by any member. The structured agenda can mean the difference between success or failure with a reluctant contractor.

F. Communication. Reports are an important means of communication which is the major element in successful Production Readiness Review planning. The communication network must consider inter-team communication, PRR team to contractor interface and the formal report. The daily close-out meetings give team structure and provide a means for coordinating action items and provide daily progress reports to the contractor. The contractor is normally very interested and concerned in the PRR findings and the possible action which may result. Therefore, he should be kept thoroughly informed of the findings and conclusions and know the desired procedure for corrective and close-out action. All PRR members must always remember in their discussions with the contractor that a government project is a two-party program and both parties have an investment: the government in money, R&D effort and mission requirement; the contractor in millions of dollars invested in capital equipment and facilities dedicated to the program.

Contractor coordination and participation must be established very early in the planning stage. Good communications will assure proper reception and disposition of PRR concerns requiring his action. The contractor is a part of the PRR team. He must be made to feel that he is a contributing party in this review, which will improve the acceptance status of the program; therefore, include the contractor in scheduling on-site visits, discussing team member conclusions and recommendations, follow-up actions, and schedules and management levels of the PRR reports.

### III. SUMMARY

Planning is critical in preparation for production and must start during the early stages of Engineering Development. The Production Readiness Review (PRR) process has been developed to assure that this planning takes place and to identify weaknesses and problems in the production planning. Planning is just as critical when preparing for Production Readiness Reviews as when planning for production. The importance of planning PRRs is recognized when one realizes that the PRR is composed of experts with different backgrounds who find themselves working together for the first time. Therefore, planning the PRR must be accomplished thoroughly and with great care to insure that the team members will work together, overlapping in technical and management areas and at the same time maintaining their independence and objectivity. Planning the PRR covers many facets including the following: (1) Team Personnel: The team is organized into functional panels and orders are issued at the Command level. Team members are selected from the many independent directorates which cover the various technologies in missile system research and development. (2) Training: Training covers review techniques, lessons learned, manufacturer history, and briefing project personnel. (3) Work Packages: During this stage of planning, work packages are developed which provide working sheets and "starter" or "fall-back" questions of the assigned review areas. Basic elements of the work package are taken from standard procedures developed by the Production Engineering Division of MICOM. (4) Structure: Each day is planned from the morning PRR meeting to the afternoon meetings with panel leaders and later meetings with contractor representatives. Significant time is scheduled for panel meetings and individual discussions. (5) Communication: Finally, a plan must incorporate a communication network. Planning communication covers the exit briefing, contractor follow-up, reporting the findings to the Project Manager, and the outline to be used for the formal report.



## NAVY PRR OVERVIEW

William D. Oaks  
Navy PESO

Just a little bit of history concerning PRRs in the Navy. The earliest record goes back to the establishment of the NPESO, originally part of the DPESO group, in the first part of 1977. A primary responsibility of NPESO was to assure that all major weapon systems being developed under the management cognizance of the Navy would be subjected to a dedicated review process of sufficient depth to accurately determine the degree of readiness for production. It was soon found that the review process itself could lead to readiness if conducted as a time phased consultation service type of program. So one of the first things our office accomplished was our own orientation with the Navy's organizations to learn just what expertise was available, and where it was located. We contacted weapon centers, support activities, ordnance stations, analysis centers, etc., and were pleasantly surprised to learn that there is an enormous amount of technical talent available in the field. However, this talent had never been coordinated Navy-wide (and we've still only scratched the surface in this respect). This talent has been assembled around some project requirements and field activities requirements but it had never been used Navy-wide -- the Navy's composed of a series of rather autonomous organizations and very few groups within the Navy have responsibilities across the board. HQNAVMAT is one of those few.

So shortly after our formation in April, we got our first assignment -- to conduct a PRR on the CH-53E Super Stallion, heavy lift helicopter being developed by Sikorsky Aircraft. The planning began -- we got the help of NAVWESA, located at the Navy Yard, borrowed one additional man from the DPESO organization, and conducted the first Navy PRR in October, just three weeks before the DoD Directive 5000.34 was signed. Even though we were still technically part of DPESO, we all put on Navy hats and our boss, Wayne Crispin, functioned as the Team Leader, reporting directly to the Project Manager for all matters related to the PRR. The final report was included as an appendix to the DCP. We participated in a few other reviews, the PHALANX, 20mm Gun; AEGIS System; and 8" Major Caliber Lightweight Gun System; but these were DoD reviews, and not run by the Navy.

We became part of the Navy in April 1978, but we were still co-located with DPESO organization until early 1979.

July 1978, however, the Navy started PRRs in a relatively big way. The F/A-18 program, led by the Naval Air Systems Command; and the Joint Cruise Missile Program led by the JCM Project Office -- you'll hear much more about these two programs from their respective team leaders a little later in the program.

So far to date, the Navy has conducted 87 reviews of 56 contractors involving 11 projects.

However, as you might suspect, most of the reviews have been conducted on just a few projects. In fact, three projects -- the F-18, Cruise Missile, and, a new one -- the LAMPS III, represent 78 percent of the reviews held. The LAMPS, by the way, is the Light Airborne Multi-Purpose System, which is basically a helicopter/shipboard/electronics package involved primarily in anti-submarine warfare. It is a joint NAVAIR/NAVSEA project, with NAVAIR leading the PRR effort, and it's similar in magnitude to the F-18 and Cruise Missile Programs.

The size of the Navy PRR team has ranged all the way from six to 44 Government participants -- we have tried to key the size of the team to criticality, complexity, and the size of the contractor organization to be reviewed. Actually, with an experienced group of professionals, the size of the team can be determined by the number of functional area/panel meetings, since it's advisable to have at least two reviewers in each meeting, or sub-panel meeting. This gives you two judgements of the contractor's responses to the interview questions.

## LESSONS LEARNED

Do your homework -- assemble all significant paperwork for review by the team to help any new people, that are new to the project, to become familiar with what has been done -- what's intended, etc. -- the production plan, deviations and waivers requested, ECPs, significant test results, the DCP, any previous "ad hoc committee" reports, and the like.

Don't get pushed into a too tight schedule on-site. Allow a week if you've got a week's work to do.

Don't go in with an army unless you're really sure from previous planning that you're going to need it. A little bit of overskill goes a long way.

Be sure to cover all significant branch operations. An outfit like TI, for instance, has machining operations assembly and test fabrication of PWBs, etc., spread over several counties of Texas and on some projects, they may all contribute to the success of the project.

The Navy PRR teams spend a good bit of effort in the selection of appropriate subcontractors, and you'll hear about this in more detail from some of our other presenters.

It has become more and more obvious lately that some sort of documentation system, or data bank, needs to be created on a DoD-wide basis to allow the dissemination of all these "lessons learned." This conference is an example, and it should help, but it won't answer all the questions I've had in the last few months. I've had project people call me and want to know: "What are the soft points with Contractor X?", "What's the quality philosophy of Contractor Y?", "What kind of importance does this guy associate with production planning?" The quality world is in the process now of creating a data bank - joint with all Services, since they have a requirement to avoid awarding contracts to sources with known "poor track records." Obviously, there are enormous problems -- legal -- for example, you can't create "blacklists" and political since most PRRs tend to show the project in a poor light, but evidently there is a bona fide need for something. All I can say at this time is to think about it. Maybe you can make some recommendations at the wrap-up.

Currently, we have five projects scheduled for additional PRRs and several others that could be scheduled for near-term reviews. The LAMPS, as I mentioned before, is our largest on-going project with some 25 reviews scheduled and critical second or third tier subcontractor reviews scheduled as the need becomes apparent.

The HARM, a high speed anti-radiation missile, joint with the Air Force, still has the reviews to support Milestone III remaining.

The F-18 is essentially complete. However, full rate production has not been achieved, and there could be some follow-up required.

PRRs for some variants of the Joint Cruise Missile are complete and others are ongoing. PIFRRs are planning for rate reviews held after Milestone III -- you'll hear more about these later.

The Sidewinder 9M variant, going on this week, is not a major, but certainly is critical.

In the future -- of course we're going to continue the LAMPS and HARM reviews much as they are now scheduled -- looking at a late '81 DSARC.

There are new variants of the Cruise Missile - specifically, the sea-launched type.

The SPARROW - 7M.

The AV-8B V/STOL Aircraft - in a holding mode right now -- involves interface problems with British Aerospace and Rolls Royce.

A couple of new aircraft.

And we've started to look closely at the ship construction area. The work so far is just looking at the typical functional areas reviewed in any other type project and then relating these by a comparison matrix to the sometimes unique problems of ship construction. It's being done element by element using the guidelines of DoD Instruction 5000.38. The intent is to develop the process into a true time-phased study integrated into the total system of reviews typical of ship construction. Two differences became immediately apparent. First, ship construction is an extremely long cycle -- four or five years. Second, it involves very low rates. As a result, tooling, as it is usually thought of - that is, unique dies, and cutting tools, etc., are almost non-existent in the yards -- tools are general purpose shop tools, like drill presses, welders, and the like. Facilities and material handling constraints like crane coverage and capacity become major issues, and since it's done outside, weather is also a constraining factor. By and large, though, the progress has been encouraging.

The Navy is learning the advantages of the PRR process and we're applying it to more and more "other than major" programs. We will continue in this direction until we find that the cost of implementation overshadows the returns.

We are investigating the application of PRR technology earlier in the project -- maybe as part of the source selection process.

Naval Material Command has established a computer data bank to be used as a repository for all project review data -- the PRDRs (Preproduction Reliability Design Reviews), PRRs, quality reviews, etc. The data are being compiled as coded action items. Later, it will be possible to display data by contractor, or functional area, or project, or any combination.

We've been trying for some time to combine parts of reviews and eliminate what seems, on the surface at least, to be duplication. The comparison matrix being used now by NAVSEA may help in the analysis.

That just about wraps it up for the general overview. Now we will get into more of the details.

## **PRR HISTORY IN THE NAVY**

- © ESTABLISHMENT OF SERVICE LEVEL (NAVY) PESO - APRIL, 1977
- © 1ST PRR RUN BY NAVY - 1ST WEEK OF OCTOBER, 1977
- © DOD DIRECTIVE 5000.34 - "DOD COMPONENTS---RESPONSIBLE FOR---PPRs"
- © NAVY PESO PART OF NAVY - APRIL, 1978
- © TO DATE - 87 REVIEWS OF 56 CONTRACTORS
- © 11 PROJECTS - 3 REPRESENT 78% OF REVIEWS
- © ATTENDANCE - 44 TO 6 GOVERNMENT PARTICIPANTS
- © LESSONS LEARNED

OPTIMUM ATTENDANCE  
ENOUGH TIME  
BRANCH OPERATIONS  
SUBCONTRACTORS  
NEED FOR OOD DATA BANK  
HOMEWORK

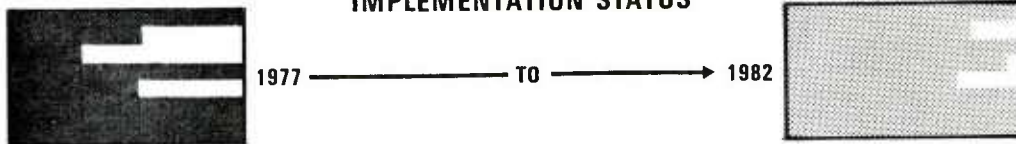
## **CURRENT PRR's**

- © LAMPS - 25 REVIEWS SCHEDULED
- © HARM - 3 REVIEWS REMAIN
- © F-18 - FOLLOW-UP ONLY
- © JOINT CRUISE MISSILE - 9 PRRs REMAIN,  
PLUS 6 PFRRs
- © SIDEWINDER - 9M

# FUTURE OF PRR's IN THE NAVY

- © CONTINUE LAMPS & HARM
- © NEW VARIANTS OF CRUISE MISSILE
- © SPARROW -7M
- © AV-8B V/STOL AIRCRAFT
- © OTHER NEW AIRCRAFT
- © SHIP CONSTRUCTION
- © MORE APPLICATIONS OF PRR's TO "OTHER THAN MAJOR" PROJECTS
- © EARLIER APPLICATION
- © CORPORATE MEMORY
- © COMBINATIONS OF REVIEW

## PRODUCTION MANAGEMENT PROGRAM IMPLEMENTATION STATUS



1980

PRODUCTION MGT ACTIVITIES		NAVSEA	NAVELEX	NAVAIR	NAVMAT	OPNAV	SECNAV	CONTRACTORS
AWARENESS		G	G	G	G	G	G	Y
INSTRUCTIONS		Y	R		G	Y	G	Y
REQUIREMENTS	IPS	Y	G	G	Y	G	Y	
	DCP	G	G	G	Y	G	Y	
	CONTRACTS BC RFP PROP APP	Y	Y	Y	G			Y
	PRR PLAN(s)	G	G	G	G			
STAFF & ORGANIZATION		Y	R	G	G			Y
EDUCATION & TRAINING	ARTICLES & PRESENTATIONS	Y	R	Y	G			Y
	COURSES	Y	R	Y	Y			
FUNDING	DEVELOPMENT (FRONT END)	R	R	Y	Y			Y
	TRAVEL FOR ON SITE REVIEW	R	R	Y	R			
ACTION ITEM STATUS REPORTING		Y		G	G	G		Y
TOTAL PROGRAM ACHIEVEMENT		Y	R	Y	Y			Y
CODE								
R	NEEDS ACCELERATED ACTION	Y	ACTION IN PROCESS	G	COMPLETED		NOT APPLICABLE	





**NAVAL AIR SYSTEMS  
COMMAND**

**NAVAIRSYSCOM  
PRR PERSPECTIVE**



LAWRENCE STAKEM

I AM HERE TO PRESENT THE NAVAL AIR SYSTEMS COMMAND PRODUCTION READINESS REVIEW PERSPECTIVE AND APPROACH AS VIEWED BY THE NAVAL WEAPONS ENGINEERING SUPPORT ACTIVITY WHICH PROVIDES THE MAJOR PRODUCTION RELATED SUPPORT TO NAVAIR ON PRR's.

## **INTRODUCTION**

- I. OVERVIEW OF NAVY PRR PROCESS**
- II. NAVY PRR PHASES**
- III. DYNAMICS OF PRR PROCESS**
- IV. SUMMARY OF PRR LESSONS LEARNED**

THESE ARE THE FOUR MAJOR TOPICS WHICH I WILL ADDRESS DURING THIS BRIEFING.

THE MAJOR EMPHASIS WILL BE ON THE NAVY PRR PHASES AND ESPECIALLY THE PLANNING PHASE PLUS THE DYNAMICS OF THE PRR PROCESS.

## **OVERVIEW OF NAVY PRR PROCESS**

- **PRR POLICY AND GUIDANCE**
- **NAVY PRR PROCESS**
- **DOD AND NAVY ORGANIZATIONAL RELATIONSHIPS**
- **NAVY PRR ORGANIZATION**

THE NAVY METHOD OF PERFORMING PRODUCTION READINESS REVIEWS IS IN STRICT CONFORMANCE WITH THAT OF THE DEPARTMENT OF DEFENSE.

FOUR (4) SUBSEQUENT SLIDES WILL CONFIRM THIS STATEMENT.

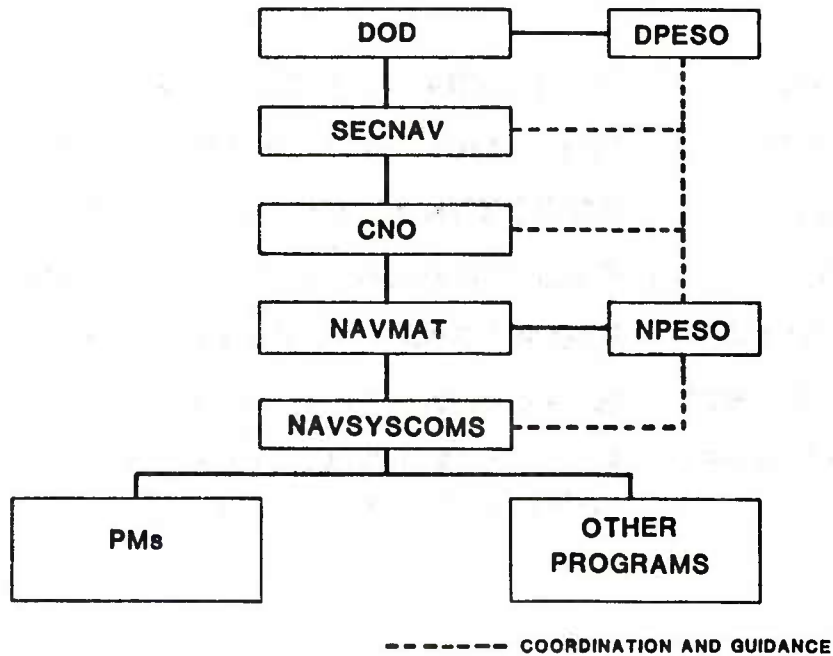
## **PRODUCTION READINESS REVIEW POLICY AND GUIDANCE**

<b>DODD 5000.1</b>	<b>MAJOR SYSTEM ACQUISITIONS, 19 MARCH 1980</b>
<b>DODD 5000.34</b>	<b>DEFENSE PRODUCTION MANAGEMENT, 31 OCTOBER 1977</b>
<b>DODI 5000.2</b>	<b>MAJOR SYSTEM ACQUISITION PROCEDURES, 19 MARCH 1980</b>
<b>DODI 5000.38</b>	<b>PRODUCTION READINESS REVIEWS, 24 JANUARY 1979</b>
<b>SECNAVINST 4801.1</b>	<b>DEFENSE PRODUCTION MANAGEMENT, 5 MARCH 1979</b>
<b>NAVMAINST 4801.1</b>	<b>DEFENSE PRODUCTION MANAGEMENT, 28 MAY 1980</b>
<b>NAVAIRINST (DRAFT)</b>	<b>PRODUCTION READINESS REVIEWS: POLICY, RESPONSIBILITIES AND PROCEDURES</b>

THIS IS A LIST OF THE MAJOR DEPARTMENT OF DEFENSE AND NAVY GUIDANCE DOCUMENTS USED BY US TO PLAN, IMPLEMENT AND COMPLETE THE NAVY PRR PROCESS PRIOR TO DSARC.

IT SHOULD BE NOTED THAT NAVMAINST 4801.1 HAS JUST BEEN REVISED ON 4 NOVEMBER 80--THE PRESIDENTIAL ELECTION DATE.

## PRR DOD AND NAVY ORGANIZATIONAL RELATIONSHIPS



WE THE NAVY, RECOGNIZE THE REQUIREMENT THAT THE DEPARTMENT OF DEFENSE PRODUCT ENGINEERING SERVICES OFFICE (DPESO) MUST CONDUCT THEIR OWN INDEPENDENT PRR ASSESSMENT. IN AN EFFORT TO SAVE COST, TIME, MINIMIZE DISRUPTIONS TO THE CONTRACTOR AND PROVIDE ON-SITE GUIDANCE WE HAVE HAD MEMBERS OF DPESO AND NPESO ACCOMPANY THE NAVY PRR TEAM ON NEARLY ALL PRRs WE HAVE PERFORMED.

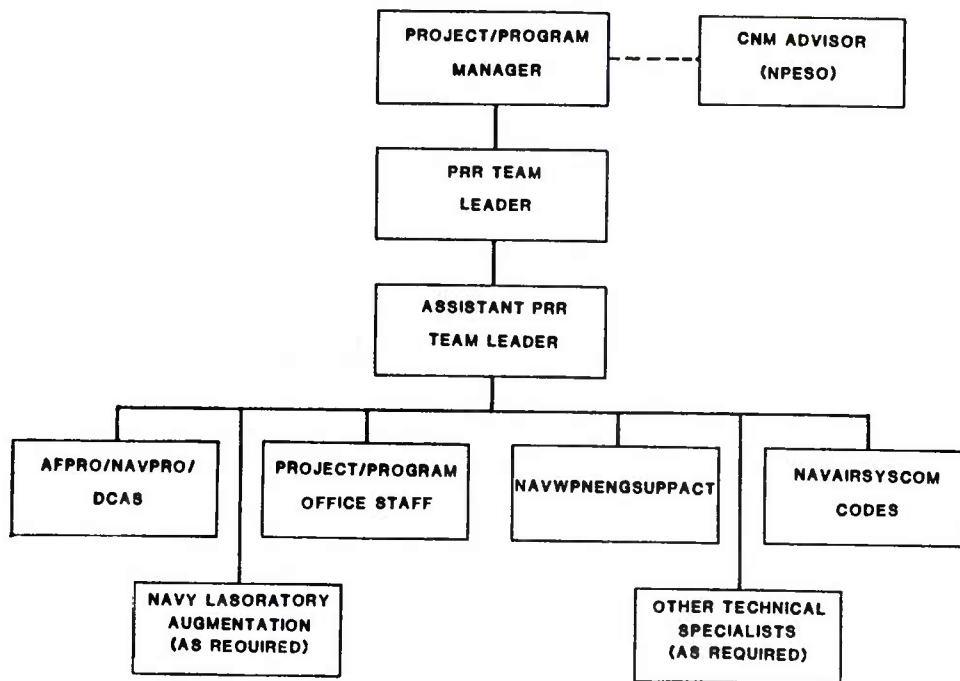
THE NAVY CONDUCTS PRRs ON ALL PROJECTS AND SELECTED PROGRAMS. OUT DEFINITION OF A PROJECT IS A MAJOR WEAPON SYSTEM SUCH AS THE F/A-18 HORNET, THE F-14 TOMCAT AND OTHERS. A PROGRAM IN THE NAVY VERNACULAR IS A MAJOR PIECE OF GFE SUCH AS AN ENGINE OR A STANDARD MISSION COMPUTER SET.

## **NAVY PRR PROCESS**

- **CONCEPTS IN ACCORDANCE WITH DOD AND SERVICE DIRECTIVES**
- **NAVY PRR PROCESS FORMALIZED**
- **NAVY PRR DEFINITION, PURPOSE AND GOAL IDENTICAL WITH DOD**

WE BELIEVE THAT THE PROCEDURES WE USE IN THE NAVY PRR PROCESS ARE IN TOTAL ACCORD WITH THE INTENT OF THE DOD PRR PROGRAM AS DEMONSTRATED BY THIS SLIDE.

## TYPICAL NAVY PRODUCTION READINESS REVIEW ORGANIZATION



THE NORMAL NAVY PROJECT MANAGEMENT EFFORT IS A MATRIX TYPE ORGANIZATION.

THE PROJECT OR PROGRAM MANAGER HAS THE ULTIMATE AUTHORITY TO IMPLEMENT THE PRODUCTION READINESS REVIEW FOR HIS SYSTEM. THE PRR TEAM LEADER IS APPOINTED BY HIM AND IS NORMALLY A MEMBER OF HIS STAFF.

THE ASSISTANT PRR TEAM LEADER IS NORMALLY APPOINTED BY THE CLASS DESK. THE CLASS DESK IN THE NAVY IS COMPRISED OF THE TECHNICAL ENGINEERING SPECIALISTS RESPONSIBLE FOR THE ENGINEERING DESIGN, DEVELOPMENT AND TEST FUNCTION.

THE OTHER ORGANIZATIONS ALSO PROVIDE PERSONNEL WITH THE REQUIRED EXPERTISE TO CONDUCT THE PRR IN AS COMPLETE AND OBJECTIVE MANNER AS IS POSSIBLE.

I AM FROM THE NAVAL WEAPONS ENGINEERING SUPPORT ACTIVITY-- (LARRY SHOW ON CHART YOUR BLOCK) AND WE ARE RESPONSIBLE FOR ALL PRODUCTION RELATED FUNCTION SUCH AS QUALITY ASSURANCE, PROCUREMENT, MANUFACTURING, PRODUCTION CONTROL AND SO FORTH.

## **NAVY PRR PHASES**

- **PLANNING PHASE**
- **IMPLEMENTATION PHASE**
- **COMPLETION PHASE**

THESE ARE THE PHASE OF OUR PRR PROCESS AND AS I STATED EARLIER; THE PLANNING PHASE IS THE ONE WE CONSIDER MOST DYNAMIC AND MOST COMPLEX. THEREFORE, MOST OF THE EMPHASIS OF THIS BRIEFING WILL ADDRESS PLANNING.

## **PLANNING PHASE FUNCTIONS**

- **SELECTION OF CANDIDATE CONTRACTORS**
- **PRR TEAM SELECTION**
- **GOVERNMENT AND INDUSTRY INDOCTRINATION AND COORDINATION**
- **DEVELOP SPECIFIC PRR DOCUMENTATION**

THESE ARE THE FOUR (4) SIGNIFICANT FUNCTIONS TO BE ACCOMPLISHED DURING THE PLANNING PHASE.

OUR EXPERIENCE WITH THE PRR PROCESS IS THAT THE THIRD BULLET "GOVERNMENT AND INDUSTRY INDOCTRINATION AND COORDINATION" IS THE MOST DIFFICULT TO ACCOMPLISH. THIS IS PRIMARILY DUE TO THE INITIAL FEAR OF A CONTRACTOR WHO HAS NEVER HAD ANY EXPERIENCE WITH THE PRR PROCESS. HE IS VERY APPREHENSIVE AND THE DIFFICULTY ARISES IN GETTING HIM TO ACCEPT THE PURPOSE OF THE PRR AND TO PUT HIM AT EASE SO THAT THE PRR CAN BE EFFECTIVELY CONDUCTED ON-SITE.

MY NEXT SLIDE WILL LIST SOME OF THE NAVY PROJECTS AND PROGRAMS WHICH HAD PRRs.

## NAVY PRR PROGRAMS/PROJECTS

### PAST:

CH-53E	AV-8B
HARM	AN/AYK-14
F/A-18	PHOENIX
LAMPS	ARBS

### PRESENT (PLANNED TO JUNE 81)

LAMPS	AN/AYK-14
AIM-7F	AIM-9M

### FUTURE:

A-18	LAMPS
AV-8B	HARM

THIS IS NOT AN ALL INCLUSIVE LIST OF PROGRAMS AND PROJECTS FOR FUTURE PRRs. WE ADD TO THIS LIST AS THE NEED DICTATES. FOR EXAMPLE, DUE TO THE IRANIAN CRISIS AND THE COMPROMISE OF THE PHOENIX MISSILE, WE ADDED THE MODIFIED MISSILE TO OUR LIST AND CONDUCTED A PRR. IF SIMILAR OR OTHER CIRCUMSTANCES REQUIRE PRRs, WE PERFORM THEM. THIS SURE KEEPS A LOT OF US ON THE ROAD.

## CONTRACTOR SELECTION PROCESS

- ANALYZE THE TOTAL PROGRAM
- DEVELOP A LIST OF CANDIDATE CONTRACTORS FOR PRR
- UTILIZE SELECTION CRITERIA
- TEAM SELECT CONTRACTORS FOR GOVERNMENT ON-SITE PRR
- ADD NEW CONTRACTORS AS PRR PROCESS DICTATES

DURING OUR ANALYSIS OF THE TOTAL PROGRAM TO SELECT CONTRACTORS FOR PRRs WE CONSIDER SUCH THINGS AS PROGRAM SIZE, COMPLEXITY AND POINT OF TIME OF THE DEVELOPMENT PHASE AND TIME REMAINING FOR THE DSARC.

KEY PERSONNEL OF THE PROGRAM MAKE AN INITIAL LIST OF CANDIDATE CONTRACTORS FOR THE PRR, THIS INITIAL LIST HAS SOMETIMES EXCEEDED 100 CONTRACTORS. WE FIND THAT CONSTRAINTS OF TIME, MANPOWER AND MONEY FORCES US TO REDUCE THIS LIST. THEREFORE, WE ESTABLISH CRITERIA TO REDUCE THIS LIST TO THOSE CONTRACTORS THAT HAVE THE MAJOR IMPACT ON THE PROGRAM.

THE NEXT SLIDE LISTS OUR CONTRACTOR SELECTION CRITERIA.

## **CONTRACTOR SELECTION CRITERIA**

- **MISSION CRITICAL**
- **RELIABILITY/MAINTAINABILITY CRITICAL**
- **NEW TECHNOLOGY**
- **HARDWARE COMPLEXITY**
- **COST CRITICAL**
- **SCHEDULE CRITICAL**
- **SUPPORT CRITICAL**
- **CONTRACTOR TRACK RECORD AND DEVELOPMENT  
PROGRESS**
- **WEAPON SYSTEM MISSION COMPATIBILITY**





## LAMPS PRODUCTION READINESS REVIEW SCHEDULE

CONTRACTOR/LOCATION	PROGRAM	DATE OF SCHEDULED_PRR
OAF, INOAL, TORONTO, CAN	RASST SYSTEM	23-27 JUN 1980
SIKORSKY, STRATFORD, CT	SH-608 AIRCRAFT	14-18 JUL 1980
IBM, OHIO, NY	VARIOUS SYSTEMS	28 JUL -01 AUG 1980
SPERRY, OTTAWA, CAN	HORIZONTAL REFERENCE SYSTEM	13-15 AUG 1980
OMIT, TORONTO, CAN	RASST HYDRAULICS	26-28 AUG 1980
FAIRCHILD, GERMANTOWN, MD	CONTROL IMO SET	10-12 SEP 1980
G-E., LYNN, MA	ENGINE (1700-GE-401)	23-26 SEP 1980
TI, DALLAS, TX	RADAR	07-10 OCT 1980
RAYTHEON, GOLETA, CA	RECEIVER SET, COUNTERMEASURE	22-24 OCT 1980
RYAN, SAN DIEGO, CA	RAVE RADAR	27-29 OCT 1980
SIENNA, BUFFALO, NY	RADIO TERMINAL SET	03-07 NOV 1980
OMIT, TORONTO, CAN	RASST HYDRAULICS	12-14 NOV 1980
CLEVELAND PNEUMATIC, CLEVELAND, OH	MLG/TLG	18-20 NOV 1980
ASTRONAUTIC, MILWAUKEE, WI	ALT/BRG INDICATORS	02-04 DEC 1980
LTV, DALLAS, TX	TAILCONE ASSEMBLY	09-11 DEC 1980
AIR RESEARCH, PHOENIX, AR	SOMERUDY LAUNCHER	06-08 JAN 1981
SPECO SPRINGFIELD, OH	SH608 TRANSMISSION	14-16 JAN 1981
TELEPHONIC, HUNTINGTON, NY	CSC/RAVE INTER UNIT	20-22 JAN 1981
RAYMOND, MIDDLETOWN, CT	MAGNETIC TAPE MEMORY	27-29 JAN 1981
SPERRY, SALT LAKE CITY, UT	RADIO TERMINAL SET	03-06 FEB 1981
SPERRY, OTTAWA, CAN	HORIZONTAL REFERENCE SYSTEM	17-20 FEB 1981
OMIT, TORONTO, CAN	RASST HYDRAULICS	03-06 MAR 1981
OAF INOAL, TORONTO, CAN	RASST SYSTEM	17-20 MAR 1981
HAMILTON STD, WINDSOR LOCKS, CI	ELECT FLIGHT CTRL SYSTEM	24-26 MAR 1981
SIKORSKY, STRATFORD, CT	SH-608 AIRCRAFT	01-03 APR 1981
IBM, OHIO, NY	VARIOUS SYSTEMS	13-17 APR 1981

THIS IS THE RESULT OF OUR INITIAL SUB-CONTRACTOR SELECTION EXERCISE ON THE LAMPS PROJECT.

THE NEXT FEW CHARTS WILL ADDRESS THE PRR TEAM SELECTION PROCESS.

## **PRR TEAM SELECTION**

- **CONSISTS OF INDIVIDUALS HAVING THE REQUISITE EXPERTISE AND EXPERIENCE**
- **SELECTED FROM:**
  - **FUNCTIONAL CODES OF SYSTEMS COMMANDS**
  - **NAVY FIELD ACTIVITIES**
  - **LOCAL GOVERNMENT OFFICES**
  - **OTHER SERVICES/AGENCIES**
  - **CIVILIAN INSTITUTIONS/UNIVERSITIES**
  - **PRIVATE INDUSTRY**

THERE ARE TWO IMPORTANT POINTS RELATED TO TEAM SELECTION, THEY ARE:

- 1) WE ALWAYS DESIRE THE MOST EXPERT PERSONNEL BUT SOMETIMES THEIR AVAILABILITY OR NON-AVAILABILITY FORCES US TO GO WITH THE NEXT BEST. THIS IS AN INHERENT MATRIX ORGANIZATIONAL PROBLEM.
- 2) WE GO TO ANY KNOWN SOURCE TO SELECT QUALIFIED PEOPLE.

## TYPICAL FUNCTIONAL AREAS

- PROGRAM MANAGEMENT
- ENGINEERING PRODUCT/DESIGN
- PRODUCTION COST
- MAKE-OR-BUY
- TESTING STATUS
- SUBCONTRACTING
- PROCUREMENT
- MANUFACTURING PLANNING
- PRODUCTION METHODS AND PROCESSES
- PRODUCTION CONTROL
- FACILITIES AND EQUIPMENT
- TOOLING AND TEST EQUIPMENT
- MATERIAL
- MANPOWER
- PLANT LAYOUT
- INTEGRATED LOGISTICS SUPPORT
- SOFTWARE

TO ACHIEVE GREATER OBJECTIVITY AND COMPLETENESS WE BREAK DOWN THE AREAS LISTED IN DODI 5000.38 "PRODUCTION READINESS REVIEW" AND 5000.34 "PRODUCTION MANAGEMENT" INTO MORE SPECIFIC, DISCRETE AREAS AS SHOWN HERE. WE HAVE ALSO DEVELOPED OVER 700 CRITERIA FOR USE BY THE PRR TEAM MEMBERS CONDUCTING THE REVIEW SO THAT THEY MAY MORE EFFECTIVELY PERFORM THE ON-SITE REVIEW.

## TYPICAL TECHNICAL EXPERTISE REQUIRED

INDUSTRIAL ENGINEERS	MACHINIST
AVIONICS	SOFTWARE
MATERIALS	FINANCIAL
SUPPLY	PLANNING
CONFIGURATION CONTROL	ILS
SYSTEMS INTEGRATION	SIGNAL SECURITY
QUALITY ASSURANCE	PRODUCTION CONTROL
ELECTRICAL ENGINEER	AERO ENGINEER
METALURGIST	CONTRACTS
PROGRAM ANALYST	PROPULSION
WEAPONS MANAGEMENT	TESTING
BUDGET/FISCAL	RELIABILITY

THIS IS JUST A TYPICAL LIST OF THE VARIED TYPES OF EXPERTISE REQUIRED AND IS SOMETIMES DIFFICULT TO HAVE AVAILABLE WHEN THE PRR TEAM SIZE IS SMALL AND ALSO WHEN ONE MUST OPERATE IN A MATRIX ORGANIZATION WHERE THE PRR TEAM LEADER MUST SOMETIMES "BEG" FOR A CERTAIN PERSON TO BE A MEMBER OF THE PRR TEAM.

## PRR TEAM MEMBER SOURCES

### DOD

PRODUCT ENGINEERING SERVICES OFFICE  
LOGISTICS AGENCY  
CONTRACT ADMINISTRATION SERVICES  
CONTRACT AUDIT AGENCY  
SYSTEMS MANAGEMENT COLLEGE

### SERVICES

NAVAL PRODUCT ENGINEERING SERVICES OFFICE  
HQS NAVAL MATERIAL COMMAND  
HQS NAVAL AIR SYSTEMS COMMAND  
NAVAL AIR TEST CENTER (PATUXENT MD)  
NAVAL WEAPONS ENGINEERING SUPPORT ACTIVITY (WASH DC)  
NAVAL AVIONICS CENTER (INDIANAPOLIS IN)  
NAVAL AIR DEVELOPMENT CENTER (WARMINSTER PA)  
NAVAL AIR PROPULSION CENTER (TRENTON NJ)  
NAVAL WEAPONS CENTER (CHINA LAKE CA)  
NAVAL WEAPONS SUPPORT CENTER (CRANE IN)  
NAVAL PLANT REPRESENTATIVE OFFICE

AIR FORCE PLANT REPRESENTATIVE OFFICE

### PRIVATE INDUSTRY

UNIVERSITY OF PRINCETON  
VEDA, INC.  
FLIGHT SYSTEMS, INC.  
POTOMAC RESEARCH, INC.  
JMK INTERNATIONAL  
TRN  
PLUS OTHERS

### OTHER GOVERNMENT

NATIONAL SECURITY AGENCY  
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

### OTHER COUNTRY GOVERNMENT AGENCIES

BRITISH MINISTRY OF DEFENCE  
CANADIAN COMMERCIAL CORPORATION

THIS CHART SHOWS THE MANY ORGANIZATIONS FROM WHICH WE HAVE OBTAINED THE  
DESIRED PRR TEAM MEMBERS.

NOTE THAT IN CANADA AND ENGLAND WE UTILIZED PERSONNEL FROM THEIR REVELANT  
ORGANIZATIONS.

## **PRR TEAM SIZE**

- **SYSTEM/SUBSYSTEM CRITICALITY OR COMPLEXITY**
- **CONTRACTOR SIZE**
- **CONTRACTOR ATTITUDE OF COOPERATION**
- **CONTRACTOR TRACK RECORD**
- **AVAILABILITY OF EXPERT PERSONNEL**
- **FUNDING AVAILABILITY**
- **DURATION OF ON-SITE PRR**

THESE ARE THE GENERAL FACTORS WHICH AFFECT THE NUMBER OF PERSONNEL ON THE TEAM.

HOWEVER, OUR EXPERIENCE HAS INDICATED THAT A SMALL TEAM (12-20 PEOPLE) OF QUALIFIED EXPERTS WHO ARE INDOCTRINATED AND KNOWLEDGEABLE OF THE PURPOSE AND PROCEDURES OF A PRR ALLOWS FOR CONDUCTING AN EFFICIENT REVIEW AND ELIMINATES A GREAT DEAL OF IRRELEVANT DISCUSSION WHICH IS NORMALLY ASSOCIATED WITH A LARGE GROUP.

NOTE: (SIMPLY STATED IT ELIMINATES A LOT OF "BULL" SESSIONS AND THEREFORE PROVIDES GOOD COMMUNICATION.)

THE MINIMIZATION OF TRAINEES/OBSERVERS/CURIOSITY SEEKERS/NON-CONTRIBUTORS COULD ENHANCE THE PROCESS. HOWEVER, POLITICAL AND/OR ORGANIZATIONAL FACTORS SOMETIMES MAKES THIS IMPRACTICAL. NO FORMAL TRAINING PROGRAM EXISTS THEREFORE WE ARE FORCED TO USE ON THE JOB TRAINING.

## **PRR TEAM ADMINISTRATIVE CHALLENGES**

- **AVAILABILITY OF REQUIRED PERSONNEL**
- **INDOCTRINATION OF PRR TEAM MEMBERS**
- **FUNDING**
- **TRAVEL, LODGING, CLEARANCES**
- **LAST MINUTE CHANGES**

I BELIEVE THAT ALL OF US WHO HAVE BEEN IN KEY ROLES OF THE PRR PROCESS  
RECOGNIZE THE PROBLEMS AND FRUSTRATIONS OF THE CHALLENGES LISTED HERE.

IT SEEMS, AND MAYBE BY PURE COINCIDENCE, THAT THE PERSON OR PERSONS YOU  
NEED OR DESIRE ARE NOT AVAILABLE FOR MANY STATED REASONS.

AS PREVIOUSLY SHOWN INDOCTRINATION OF GOVERNMENT TEAM MEMBERS IS SEVERELY  
HAMPERED BY THE FACT THAT TEAM MEMBERS ARE COMING FROM VARIED AND WIDELY  
SCATTERED GEOGRAPHICAL LOCATIONS. IN AN ATTEMPT TO OVERCOME THIS, WE IN  
THE NAVY ASSURE THAT THERE ARE PRR EXPERIENCED MEMBERS IN EACH FUNCTIONAL  
AREA TO BRIEF THOSE NON-EXPERIENCED TEAM PERSONNEL THEIR MEMBERS AT THE  
ON-SITE LOCATION PRIOR TO THE REVIEW.

LITTLE NEED BE SAID ABOUT LAST MINUTE CHANGES, THEY ARE A "HEADACHE."

## **GOVERNMENT AND INDUSTRY INDOCTRINATION AND COORDINATION**

- **JOINT GOVERNMENT AND INDUSTRY  
INDOCTRINATION MEETINGS OF KEY  
PERSONNEL**
- **EXCHANGE OF PRR RELATED  
DOCUMENTATION**
- **COORDINATION AND NEGOTIATION OF  
SCHEDULES, PROCEDURES AND SUPPORT  
FOR ON-SITE REVIEW**

WE HAVE OBSERVED THAT THE INDOCTRINATION OF CONTRACTORS, ESPECIALLY THOSE WHO HAVE NEVER EXPERIENCED A PRR TO BE A CHALLENGING EFFORT.

THE NAVY INDOCTRINATES CONTRACTORS IN ONE OR ALL OF THE FOLLOWING MANNERS:

- A) VISIT THEIR FACILITY AND BRIEF THEM ON THE PRR PROCESS
- B) HAVE CONTRACTORS KEY PERSONNEL MEET IN WASHINGTON, D.C.
- C) PROVIDE AND EXPLAIN THE BASIC POLICY AND GUIDES SHOWN EARLY IN THIS BRIEFING

IN SUMMARY WE MUST LEAD MANY OF THE CONTRACTORS BY THE HAND.

VERY INSTRUMENTAL AND KEY TO THIS INDOCTRINATION AND COORDINATION EFFORT IS TO HAVE INDUSTRY PROVIDE ONE AND NOT MORE THAN TWO KEY PERSONNEL AS A FOCAL POINT OR POINT OF CONTACT FOR THE PRR.

THIS PROVIDES A MOST EFFICIENT WAY FOR ACCOMPLISHING THE TASKS IN BULLET NUMBER THREE.

## **PRR DOCUMENTATION**

- **SELECT APPROPRIATE FUNCTIONAL AREAS FOR REVIEW**
- **DEVELOP RELEVANT SPECIFIC CRITERIA FOR OBJECTIVITY AND COMPLETENESS**
- **ESTABLISH AGENDA FOR PRR**
- **PROVIDE TEAM WORK PACKAGES WHICH INCLUDE:**
  - **INSTRUCTIONS**
  - **CRITERIA**
  - **DOCUMENTATION FORMATS**
  - **AGENDA**

THE FINAL STEP IN THE PRR PLANNING PHASE IS THE DEVELOPMENT AND OR AVAILABILITY OF REQUIRED DOCUMENTATION FOR BOTH THE GOVERNMENT PRR TEAM AND CONTRACTOR.

THE SIGNIFICANT POINT RELATED TO DOCUMENTATION IS IN BULLET NUMBER FOUR. THIS FUNCTION SHOULD BE ACCOMPLISHED AS EARLY AS POSSIBLE TO ALLOW SUFFICIENT PREPARATION TIME AND FACILITATE COORDINATION BETWEEN THE PRR GOVERNMENT TEAM MEMBER AND HIS COUNTERPART IN INDUSTRY.

## IMPLEMENTATION PHASE

- INITIAL TEAM MEMBER BRIEFING
- BRIEFING OF PROGRAM BY LOCAL GOVERNMENT OFFICE
- BRIEFING BY PRIME CONTRACTOR AS REQUIRED
- PRR TEAM LEADER BRIEFING TO CONTRACTOR
- CONTRACTOR BRIEFING OF PROGRAM
- CONDUCT ON-SITE PRR
- DOCUMENT TEAM LEADER FINDINGS
- DAILY REPORTING TO THE TEAM LEADER
- DAILY CONTRACTOR DEBRIEFING
- INFORMAL FINDINGS PROVIDED TO CONTRACTOR

FOR CLARIFICATION, THE IMPLEMENTATION PHASE ACTIVITIES SHOWN HERE ARE THOSE CONDUCTED DURING THE PRR AT THE CONTRACTOR'S FACILITY.

WE HAVE FOUND ALL THESE ACTIVITIES TO BE OF BENEFIT AND IF WE WERE TO LIST THE THREE MOST BENEFICIAL TO THE NAVY AND THE CONTRACTOR THEY WOULD INCLUDE THE LAST THREE BULLETS.

THE DAILY REPORTING TO THE TEAM LEADER BY THE TEAM IMPROVES THE INTERACTION AND EXCHANGE OF INFORMATION, MINIMIZES DUPLICATION OF GOVERNMENT TEAM AND INDUSTRY EFFORT PLUS ASSURING THAT ALL MEMBERS OF INDUSTRY AND GOVERNMENT ARE "SINGING THE SAME TUNE," THAT MEANS THEY ARE PROVIDING THE SAME FACTS.

THE DAILY CONTRACTOR DEBRIEFING BY THE PRR TEAM LEADER PRECLUDES ANY SURPRISES, MINIMIZES MISUNDERSTANDINGS OR MIS-COMMUNICATION AND ASSISTS IN RAPIDLY RECTIFYING PROBLEM AREAS.

PRIOR TO DEPARTING THE FACILITY, THE CONTRACTOR IS GIVEN A BRIEFING OF THE TOTAL TEAM FINDINGS AND PROVIDED A LIST OF POTENTIAL PROBLEMS FOR HIS INFORMAL USE. THE CONTRACTOR IS ALLOWED TO INVITE ANY OF HIS STAFF TO THIS BRIEFING AND WE HAVE FOUND THAT IT IS BENEFICIAL FROM A PROFESSIONAL ASPECT AND GETTING MANAGEMENT ATTENTION.

## **COMPLETION PHASE**

- **REPORT FINDINGS AND RECOMMENDATIONS TO PROJECT/PROGRAM MANAGER**
- **ASSESS RISK**
- **ALTERNATIVES TO REDUCE OR ELIMINATE RISK**
- **FORMAL ACTION REQUIRED OF CONTRACTOR**
- **FOLLOW-UP TO COMPLETION**
- **DOCUMENT FINDINGS FOR DSARC**

THE COMPLETION PHASE IS PRIMARILY THE RESPONSIBILITY OF THE NAVY PROJECT/PROGRAM MANAGER. IT IS ONLY HE WHO HAS THE CHARTER AND RESPONSIBILITY TO EFFECTIVELY MANAGE HIS WEAPON SYSTEM.

FROM THE NAVWPNEGSPACT PERSPECTIVE THE TWO MOST IMPORTANT ASPECTS OF THIS PHASE ARE TO ENSURE THAT THE ACTION ITEMS ARE TRACKED AND THE STATUS OF THEIR PROGRESS TO COMPLETION IS MONITORED PLUS THE ESTABLISHMENT OF A REPOSITORY OF DATA SO THAT THE FINDINGS CAN BE DOCUMENTED FOR USE AT DSARC.

THE FOLLOW UP TO COMPLETION COULD BECOME AN EXTENDED TASK IF THE DATES ESTABLISHED TO COMPLETE THE CORRECTIVE ACTIONS FOR SOLVING THE IDENTIFIED DEFICIENCIES ARE NOT REALISTIC.

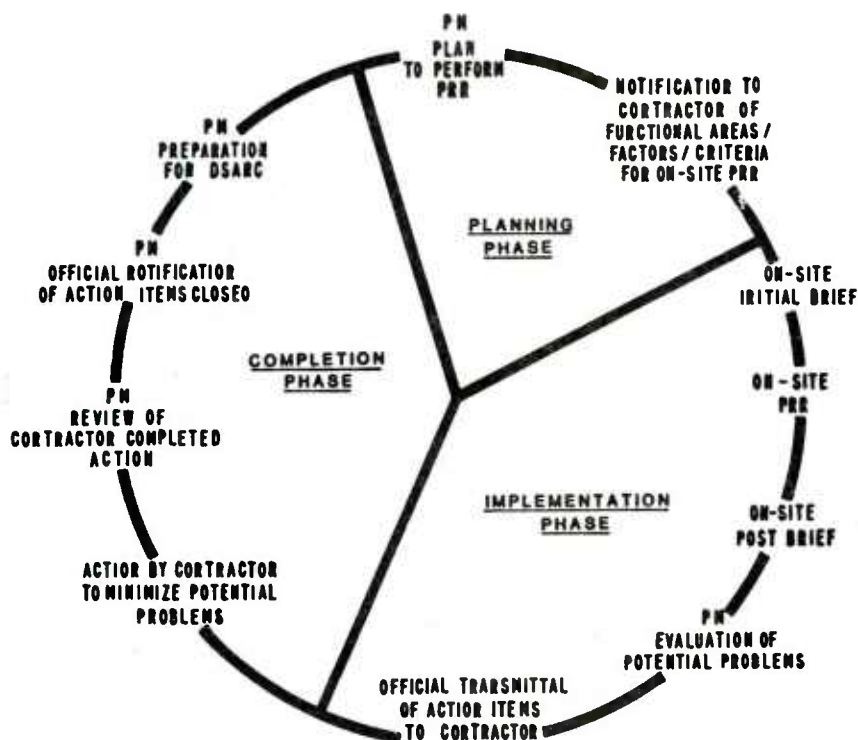
## **PROGRAM/PROJECT MANAGEMENT RESPONSIBILITIES**

- **CONTRACTURAL REQUIREMENT FOR PRR**
- **FUNDING FOR CONTRACTOR AND GOVERNMENT AGENCIES**
- **COORDINATE PRR SCHEDULE**
- **ESTABLISH REALISTIC LEAD TIMES PRIOR TO DSARC**
- **EVALUATE, COORDINATE AND MONITOR PROGRESS OF PRR TEAM ACTION ITEMS**
- **FOLLOW-UP WITH SUBSEQUENT REVIEWS TO TRACK PROGRESS**
- **DOCUMENT FINDINGS IN A DATA REPOSITORY**
- **RESOLVE ISSUES FOR ADDRESSAL AT DSARC**

THIS LISTING OF RESPONSIBILITIES ENCOMPASS ACTIVITIES WHICH MUST BE ACCOMPLISHED FROM THE POINT IN TIME THAT THE DECISION WAS MADE THAT A PROGRAM WILL HAVE A PRR UP TO THE DSARC MILESTONE.

OF THESE RESPONSIBILITIES, THE LAST ONE IS PROBABLY THE MOST IMPORTANT TO THE OVERALL PROGRAM AND THIS REQUIRES CLOSE COORDINATION AND TECHNICAL EFFORT AMONG THE PARTICIPANTS WHICH INCLUDE PROGRAM MANAGERS, DPESO, NPESO, PRIME CONTRACTOR/SUBCONTRACTOR, NSARC AND DSARC PRINCIPALS.

## PRR ACTIVITY CHART



IN A SUMMARY MANNER THIS SHOWS THE ACTIVITIES AND PRINCIPLE PHASES OF THE PRR PROCESS WHICH WERE JUST DISCUSSED. THE ACTIVITIES BEGIN AT THE TOP AND PROCEED CLOCKWISE.

THERE ARE THREE ADDITIONAL CHARTS WHICH LIST THE DESIRED BENEFITS OF THE PRR PROCESS; THE DYNAMICS OF THE PRR AND A SUMMARY OF THE MORE SIGNIFICANT PRR LESSONS LEARNED. I WILL VERY BRIEFLY DISCUSS EACH OF THESE.

## **PRR DESIRED BENEFITS**

- **TIMELY IDENTIFICATION AND RESOLUTION OF POTENTIAL PROBLEMS**
- **COST SAVINGS AND COST AVOIDANCE**
- **INCREASED CONFIDENCE IN ACHIEVEMENT OF PROGRAM OBJECTIVES**
- **GREATER ASSURANCE OF ORDERLY TRANSITION TO PRODUCTION**
- **DSARC APPROVAL**

THE MOST DESIRED BENEFIT TO BE DERIVED FROM THE PRR PROCESS IS TO ASSURE THAT THE PROGRAM RISKS HAVE BEEN REDUCED TO AN ACCEPTABLE LEVEL WHICH RESULTS IN DSARC APPROVAL TO PROCEED INTO PRODUCTION.

## **DYNAMICS OF PRR IMPLEMENTATION PROCESS**

- **CONTINUOUS SCHEDULE CHANGES**
- **PRR SIZE AND TEAM MEMBER CHANGES**
- **REVISIONS TO PRR PROCEDURES**
- **NEW AND VARIED ATTITUDES OF CONTRACTORS/SUBCONTRACTORS**
- **AVAILABILITY OF TIME, MANPOWER AND MONETARY RESOURCES**
- **EXPERTISE AND OBJECTIVITY OF PRR TEAM MEMBERS**
- **VARIED DOD AND SERVICE AREAS OF EMPHASIS**
- **NAVY MANAGEMENT ABILITY TO ENSURE CONTRACTOR ACTION FOR PROBLEM RESOLUTION**

FROM OUR EXPERIENCE, THESE ARE THE MAJOR ELEMENTS THAT CAUSE THE PRR PROCESS TO BE ONE OF A DYNAMIC NATURE.

(PAUSE AND LET THEM LOOK AT THE SLIDE)

ASSOCIATED WITH ANY DYNAMIC PROCESS THERE IS AN INHERENT NEED FOR RESPONSE IN THE FORM OF "LESSONS LEARNED." OUR LESSONS LEARNED ARE SHOWN ON THE NEXT AND FINAL SLIDE.

## **SUMMARY OF PRR LESSONS LEARNED**

- **EARLY PLANNING AND COORDINATION IS VITAL**
- **FLEXIBILITY FOR SCHEDULE AND MANPOWER ALLOCATION IS REQUIRED**
- **INDOCTRINATION OF CONTRACTOR AND GOVERNMENT REQUIRED**
- **FORMALIZATION OF TRAINING VERY DESIRABLE**
- **FUNDING SHOULD BE PROVIDED EARLY**
- **CORRECTIVE ACTION TIME FOR POTENTIAL PROBLEMS SHOULD BE REDUCED**
- **PROCEDURES FOR TRANSFER OF KNOWLEDGE AMONG SERVICES OF CONTRACTOR'S PERFORMANCE SHOULD BE EXPLORED**
- **REDUCTION OF DUPLICATIVE GOVERNMENT EFFORTS SHOULD BE EXAMINED**
- **THE DEVELOPMENT OF MORE FINITE METHODS FOR PRR RISK ASSESSMENTS SHOULD BE STUDIED**
- **ALL FUNCTIONAL AREAS SHOULD BE REVIEWED SIMULTANEOUSLY**
- **DAILY FUNCTIONAL AREA DEBRIEF IS VERY EFFECTIVE**
- **PRESENCE OF NAVY PRR TEAM STIMULATED CONTRACTOR**

THIS SUMMARY LIST OF LESSONS LEARNED IS NOT RANKED IN ANY ORDER OF IMPORTANCE. FROM A PERSONAL VIEWPOINT, I CONSIDER THAT THE FORMALIZATION OF TRAINING RELATED TO THE PRR PROCESS IS NECESSARY. WE MUST ASSURE THAT THERE IS A READY POOL OF EXPERIENCED TALENT AVAILABLE SO THAT THE PERSONAL BURDENS OF THE PRESENTLY EXISTING SMALL NUMBER OF EXPERTS CAN BE REDUCED. THE PRR EFFORT IS A VALUABLE AND IMPORTANT ONE AND ACCOMPLISHING THE MANY ASSOCIATED TASKS SHOULD NOT BE THE RESPONSIBILITY OF A FEW GOOD PEOPLE.

THIS CONCLUDES MY BRIEFING



F/A-18  
PRODUCTION READINESS REVIEW  
PROGRAM

CAPTAIN L.B. GALLION, USN, (RET)

F/A-18 PRR PROGRAM

- OVERVIEW
- SCHEDULE
- PLANNING
- KEY FEATURES
- LESSONS LEARNED
- RECOMMENDATIONS

## OVERVIEW

- DEFINITION
- POLICY DIRECTIVES
- APPROACH
- IMPLEMENTATION

## OVERVIEW

- DEFINITION:
  - A FORMAL REVIEW, SUPPORTED BY A SERIES OF INCREMENTAL EVALUATIONS TO DETERMINE:
    - WHETHER A SYSTEM OR EQUIPMENT UNDER DEVELOPMENT IS READY FOR EFFICIENT AND ECONOMICAL QUANTITY PRODUCTION.
    - IF ADEQUATE PLANNING FOR THE PRODUCTION PHASE HAS BEEN ACCOMPLISHED.
    - WHETHER MANUFACTURING/ENGINEERING PROBLEMS ENCOUNTERED DURING DEVELOPMENT HAVE BEEN RESOLVED.

## OVERVIEW

- POLICY DIRECTIVES - 1977
  - DOD DIRECTIVE 5000.1 - 18 JAN 1977
  - DOD DIRECTIVE 5000.2 - 18 JAN 1977
  - DECISION COORDINATING PAPER
- NEW/REVISED POLICY DIRECTIVES - 1980
  - DOD DIRECTIVE 5000.1 - 19 MAR 1980
  - DOD DIRECTIVE 5000.2 - 19 MAR 1980
  - DOD INSTRUCTION 5000.38 - 24 JAN 1979

## OVERVIEW

- APPROACH
  - REVIEWED OTHER SERVICES' POLICY DIRECTIVES AND PROCEDURES
  - CONTACTED VENDORS WHO HAD COMPLETED REVIEWS
  - SOLICITED COMMENTS FROM DOD PRODUCTION MANAGEMENT PERSONNEL

## OVERVIEW

- IMPLEMENTATION
  - DEVELOPED F/A-18 PRODUCTION  
READINESS REVIEW PLAN
  - REQUESTED REVIEW BY OSD, NAVMAT,  
NAVY AND CONTRACTOR PERSONNEL
  - PLAN APPROVED BY CHIEF OF NAVY MATERIAL  
MARCH 1978 AND PROMULGATED

## SCHEDULE

- FIRST INCREMENTAL PRRs FOR PROGRAM REVIEW NOVEMBER 1978
  - JUNE 1978 - AUGUST 1978
  - 5-9 JUNE 78 . . . . .MCAIR
  - 19-22 JUNE 78 . . . . .NORTHROP
  - 14-17 AUGUST 78 . . . .GENERAL ELECTRIC
  - 29-31 AUGUST 78 . . . .HUGHES
- SELECTED SUBCONTRACTOR PRRs
  - DECEMBER 1978 - NOVEMBER 1979
- SECOND INCREMENTAL PRR
  - FEBRUARY 1979 - APRIL 1979
- THIRD INCREMENTAL PRR FOR DSARC/PROGRAM REVIEW MARCH 1980
  - OCTOBER 1979 - DECEMBER 1979
- FOURTH INCREMENTAL PRR FOR DSARC OCTOBER 1980
  - JUNE 1980 - AUGUST 1980

## PLANNING

- FUNCTIONAL AREAS
- REVISED FUNCTIONAL AREAS
- SAMPLE TEAM COMPOSITION
- SAMPLE DAILY SCHEDULE
- SUMMARY REPORT FORMAT

## PLANNING

- FUNCTIONAL AREAS
  - PROGRAM MANAGEMENT
  - ENGINEERING PRODUCT/DESIGN
  - PRODUCTION COST
  - MAKE OR BUY
  - TESTING STATUS
  - SUBCONTRACTING
  - MANUFACTURING PLANNING
  - SOFTWARE
  - PRODUCTION METHODS AND PROCESSED
  - PRODUCTION CONTROL
  - FACILITIES AND EQUIPMENT
  - TOOLING AND TEST EQUIPMENT
  - MATERIAL
  - MANPOWER
  - PLANT LAYOUT
  - QUALITY ASSURANCE
  - INTEGRATED LOGISTICS SUPPORT

## PLANNING

- REVISED FUNCTIONAL AREAS
  - PROGRAM MANAGEMENT
  - PRODUCTION STATUS
  - DEVELOPMENT
  - QUALITY ASSURANCE
  - INTEGRATED LOGISTICS SUPPORT
  - SOFTWARE MANAGEMENT

## PLANNING

### SAMPLE TEAM COMPOSITION GENERAL ELECTRIC PRODUCTION READINESS REVIEW (F404 ENGINE)

#### TEAM LEADER GROUP

CAPT L.B. GALLION, PMA265-5	TEAM LEADER
MR. R. STEPLER, AIR5123F2	ASSISTANT TEAM LEADER
MR. S. PATELLOS, FSI	ADVISOR TO TEAM LEADER

#### FUNCTIONAL AREA GROUPS

<u>PROGRAM MANAGEMENT</u>	<u>INTEGRATED LOGISTICS SUPPORT</u>	<u>QUALITY ASSURANCE</u>
*CDR W. KRIEG, PMA-265-2	*MR. J. SYLVESTER, AIR4105A	*MR. J. MCBRIDE, ESA-672B
<u>PRODUCTION STATUS</u>	MR. N. GALLIPOLI, AIR4113A5	<u>OBSERVERS</u>
*CDR W. BROWN, PMA265-B	LCDR R. KIEFER, PMA265-C	MR. SULLIVAN, DPESO
MR. E. CARROLL, ESA-4B	<u>DEVELOPMENT STATUS</u>	MR. W. OAKS, NPESO
MR. E. SHINN, ESA-61	*MR. R. PRINE, AIR53613A	MR. J. WHITT, DPESO

PLANNING

SAMPLE DAILY SCHEDULES:

FIRST DAY SCHEDULE

0800 NAVY TEAM MEETING  
0900 BRIEF BY LOCAL GOVERNMENT  
REPRESENTATIVE  
1000 BRIEF BY PRIME CONTRACTOR  
TO NAVY TEAM  
1100 BRIEF TO CONTRACTOR BY PRR  
TEAM LEADER  
1200-1300 LUNCH  
1300 BRIEF BY CONTRACTOR TO NAVY  
TEAM AND PRIME CONTRACTOR  
1430 ONE ON ONE DISCUSSIONS  
1600 MEETING WITH PRR TEAM LEADER  
1700 DEBRIEF CONTRACTOR ON  
SIGNIFICANT EVENTS

LAST DAY SCHEDULE

0800-1000 CONTINUE ONE ON ONE  
1000-1100 PREPARE ACTION ITEMS AND  
COORDINATE WITH PRIME AND  
SUBCONTRACTOR  
1100-1200 PREPARE EXIT DEBRIEF  
1300- EXIT DEBRIEF FOR CONTRACTOR  
BY NAVY TEAM MEMBERS

PLANNING

SUMMARY REPORT FORMAT\*

- NUMBER OF CRITERIA EVALUATED: . . . . .
- NUMBER OF CRITERIA FOUND SATISFACTORY . . . . .
- NUMBER OF EXCEPTIONAL FINDINGS: . . . . .
- NUMBER OF POTENTIAL PROBLEMS: . . . . .
  - IN WORK. . . . .
  - OPEN . . . . .
- TOTAL POTENTIAL PROBLEMS: . . . . .
- INITIAL RISK ASSESSMENT: . . . . .
  - HIGH . . . . .
  - MEDIUM . . . . .
  - LOW. . . . .
  - NO KNOWN . . . . .

\* PREPARED FOR EACH FUNCTIONAL AREA REVIEWED

#### KEY FEATURES

- PROJECT OFFICE DESIGNATED CENTRAL POINT FOR OVERALL MANAGEMENT
- FACTORS AND CRITERIA DEVELOPED FOR EACH FUNCTIONAL AREA
- ALL FUNCTIONAL AREAS REVIEWED AT SAME TIME
- TEAM SIZE, SELECTION AND TRAINING CLOSELY MONITORED
- CONTRACTOR PRE BRIEFS AND EXIT DEBRIEFS DEVELOPED
- DETAILED SCHEDULE COORDINATED WITH CONTRACTOR
- INITIAL SUB-CONTRACTOR SELECTION COMPLETED
- ACTION ITEM REPORTING PROCEDURES IMPLEMENTED

#### LESSONS LEARNED

- REQUISITE PLANNING
- DEDICATED PROJECT OFFICE COORDINATION
- FLEXIBLE REVIEW PROCESS
- EARLY OSD ROLE DEFINITION
- POSSIBLE JOINT SERVICE APPROACH
- TIMELY ACTION ITEM FOLLOW UP SYSTEM
- CONSISTENT TEAM MEMBERSHIP

### RECOMMENDATIONS

- DON'T INSTITUTIONALIZE THE PROCESS
- PROJECT OFFICE HAS KEY ROLE IN THE PROCESS
- FLEXIBILITY MUST BE MAINTAINED
  - SCHEDULES
  - STATUS OF PROGRAM
- TIMELY IMPLEMENTATION WILL PROVIDE DESIRED RESULTS

1. The first part of the paper discusses the importance of understanding the underlying structure of the data. This is particularly relevant in the context of machine learning, where the model's performance is heavily dependent on the quality and structure of the input data.

2. The second part of the paper focuses on the development of a new algorithm for solving the problem of finding the minimum variance unbiased estimator (MVUE) for the parameters of a normal distribution. This algorithm is based on the theory of sufficient statistics and the Rao-Blackwell theorem.

3. The third part of the paper presents a detailed analysis of the asymptotic properties of the proposed estimator. It is shown that the estimator is consistent and efficient, and that its variance approaches the Cramér-Rao lower bound as the sample size increases.

4. The fourth part of the paper provides a numerical example to illustrate the performance of the proposed estimator. The results show that the estimator performs well in terms of both bias and variance, and that it is robust to deviations from the normality assumption.

5. The fifth part of the paper discusses the implications of the findings for future research. It is suggested that further work should be done to extend the results to other distributions and to develop more efficient algorithms for solving the problem of finding the MVUE.

6. The sixth part of the paper concludes with a summary of the main findings and a list of references.

TITLE: A PRAGMATIC LOOK AT THE PRODUCTION READINESS REVIEW PROCESS FROM  
THE NAVPRO PROSPECTIVE

AUTHOR: H. A. MCCORMICK, DIRECTOR OF THE INDUSTRIAL DIVISION, NAVPRO LYNN

AUTHOR'S BACKGROUND

THE AUTHOR RECEIVED A BSBA IN 1959 FROM BOSTON COLLEGE, MAJORING IN  
INDUSTRIAL MANAGEMENT.

HE IS A 1974 GRADUATE OF THE CORNELL BUSINESS AND PUBLIC ADMINISTRATION  
GRADUATE SCHOOLS EDUCATION FOR PUBLIC MANAGEMENT PROGRAM.

MR. MCCORMICK PREVIOUSLY GAVE A RESEARCH PAPER AT THE DOD'S SIXTH  
ANNUAL PROCUREMENT RESEARCH SYMPOSIUM HELD AT THE U.S. MILITARY ACADEMY,  
WEST POINT, NEW YORK IN 1977. THE PAPER WAS ENTITLED "WORKLOAD ASSESSMENT  
AND MANPOWER APPORTIONMENT IN DCASR BOSTON'S PRODUCTION DIRECTORATE."

HE HAS HAD SEVERAL MANAGEMENT ASSIGNMENTS IN PLANT OFFICES AND AS A  
REGIONAL STAFF MANAGER, DURING WHICH HE PARTICIPATED IN MANY PRODUCTION  
READINESS REVIEWS.

DURING HIS TENURE WITH DCAS, HE HAS HAD SPECIAL ASSIGNMENTS FOR DLA  
HEADQUARTERS.

HE CURRENTLY HAS A SPECIAL ASSIGNMENT FROM NAVAIR HEADQUARTERS (AIR-  
519) TO IMPLEMENT AND TEST THE NEW SYSTEM CONCEPT FOR NAVY PLANT OFFICES  
CALLED CONTRACTOR OPERATING SYSTEM EVALUATION AND MONITORING PROGRAM OR  
COSEMP.

● NOW THAT THE POLITICAL SEASON IS OVER, THE POLITICIANS ARE FAIR GAME.

● AT A HOT CHICAGO RALLY WILLIAM JENNINGS BRYAN WAS HOLDING FORTH IN HIS BEST ORATORICAL STYLE.

"WHILE WE ARE MEETING HERE," HE SAID, "MRS. BRYAN IS SLEEPING IN A HUMBLE BOARDINGHOUSE DOWN BY THE STOCKYARDS. BUT THAT'S ALL RIGHT, COME NEXT MARCH SHE'LL BE SLEEPING IN THE WHITE HOUSE."

THAT WAS TOO MUCH FOR A HECKLER IN THE CROWD, WHO PROMPTLY PIPED, "IF SHE'S IN THE WHITE HOUSE IN MARCH SHE'LL BE SLEEPING WITH MCKINLEY."

SLIDE #1 ON

● NOW THAT'S CRITICISM. AS PARTICIPANTS IN PRODUCTION READINESS REVIEWS, WE ARE CRITICS.

● HENRY JAMES SAYS OF CRITICISM:

"THE CRITICAL SENSE IS SO FAR FROM FREQUENT THAT IT IS ABSOLUTELY RARE, AND THE POSSESSION OF THE CLUSTER OF QUALITIES THAT MINISTER TO IT IS ONE OF THE HIGHEST DISTINCTIONS....IN THIS LIGHT ONE SEES THE CRITIC AS THE REAL HELPER OF THE ARTIST, A TORCHBEARING OUTRIDER, THE INTERPRETER, THE BROTHER.... JUST IN PROPORTION AS HE IS SENTIENT AND RESTLESS, JUST IN PROPORTION AS HE REACTS AND RECIPROCATES AND PENETRATES IS THE CRITIC A VALUABLE INSTRUMENT."

SLIDE #1 OFF

● SO MUST WE IN THE PRR BE A VALUABLE INSTRUMENT AND PENETRATE AS CONSTRUCTIVE CRITICS.

● CAPTAIN COLE, USN, HAS CHARACTERIZED THE PRR IN THE JULY-AUGUST ISSUE OF THE PROGRAM MANAGER AS FOLLOWS:

"THE ESSENCE OF THE PRODUCTION READINESS REVIEW IS A ONE-ON-ONE CONSULTATION BETWEEN THE MILITARY DEPARTMENT AS THE CUSTOMER AND SYSTEM OR SUBSYSTEM CONTRACTOR."

SLIDE #2 ON

- THE PURPOSE OF THE REVIEW IS TO ASSESS THE PRODUCIBILITY OF THE SYSTEM AT THE MANUFACTURING FACILITY.
- BY MAKING A CRITICAL REVIEW OF CURRENT STATUS, FUTURE RISKS WILL BE MINIMIZED AND PROBLEM AREAS WILL SURFACE EARLY.
- THIS (PRR) IS MANAGEMENT BY OBJECTIVE IN ITS CLASSICAL SENSE....TO USE A HACKNEYED PHRASE....THIS IS WHERE THE RUBBER MEETS THE ROAD.
- WE AT THE PLANTS SHOULD BE OPTIMISTIC WITH A HEALTHY DEGREE OF SKEPTICISM.

SLIDE #2 OFF

- THE PRR IS PRIMARILY MANUFACTURING ORIENTATED, BUT IT TRANSCENDS MISSIONS AND DEPARTMENTS.

SLIDE #3 ON

- THERE IS NO SUBSTITUTE FOR DETAILED PLANNING.
- WE NOT ONLY WANT A ROAD MAP, WE WANT THE TRAFFIC LIGHTS, BRIDGES, RAILROAD CROSSINGS, DETOURS, AND THE WEATHER FORECAST.
- SIGNIFICANT REVISIONS TO DOD DIRECTIVES 5000.1 AND 5000.2 WERE SIGNED BY THE SECRETARY OF DEFENSE W. GRAHAM CLAYTOR, JR. ON 19 MARCH 1980.
- THE INTENT OF THE REVISIONS IS TO STREAMLINE THE ACQUISITION PROCESS FOR PROGRAM MANAGERS AND PINPOINT RESPONSIBILITIES.

SLIDE #3 OFF

- LET'S LOOK AT A SUMMARY OF THE REVISIONS AND THE LINKAGE TO THE IMPORTANT ROLE THAT THE PLANT OFFICE PERFORMS IN THIS PROCESS, BY THE FLOWDOWN OF POLICY CHANGES.

SLIDE #4 ON

- THERE ARE FOUR NEW POLICY STATEMENTS IN DOD DIRECTIVE 5000.1: AFFORDABILITY, ACQUISITION TIME, STANDARDIZATION, AND LOGISTIC SUPPORTABILITY.

- FIRST, THE AFFORDABILITY ASPECT....DOD'S CONSERVATIVE ESTIMATES INDICATE THAT ANTICIPATED PROCUREMENT REQUIREMENTS OVER THE NEXT 15 YEARS WILL EXCEED ANTICIPATED APPROPRIATIONS BY A FACTOR OF TWO.
- SECOND, THE ACQUISITION TIME....IS A RECOGNITION THAT TIME LOST EQUATES TO EXCESS COSTS FROM BOTH INFLATIONARY AND OBSOLETE VIEWPOINTS. A COROLLARY TO THESE FACTORS IS THE LONGER THE ACQUISITION CYCLE THE SHORTER THE FLEET USE DUE TO TECHNOLOGICAL ADVANCEMENTS.
- NEXT, STANDARDIZATION: FORD MOTOR COMPANY HAS THEIR WORLD CAR....WE FOR OUR OWN AND ALLIED COUNTRIES REQUIRE STANDARDIZATION FOR INTERCHANGEABILITY AND PRODUCIBILITY AS WELL AS MAINTAINABILITY AND SUPPORTABILITY.
- THE FOURTH POLICY STATEMENT, LOGISTIC SUPPORTABILITY, SHARES EQUAL SALIENCY WITH THE OTHER THREE. THE ADEQUACY OF LOGISTICS PLANNING WILL NOW BE CONSIDERED EARLIER AT MILESTONE II, RATHER THAN MILESTONE III, TO WHICH THE LOGISTICIANS SAY AMEN.

SLIDE #4 OFF

- PRIOR TO DISCUSSING THE PLANT OFFICE PRR ROLE, LET'S LOOK AT THE DISCUSSION ITEMS WHICH ARE NEW IN THE INITIAL PLANNING STATEMENT (IPS) AND ARE IN FACT GERMANE TO THE PLANT OFFICE.

SLIDE #5 ON

- COST EFFECTIVENESS ANALYSIS
- ORGANIZATIONAL/OPERATIONAL CONCEPT
- DATA MANAGEMENT
- CONFIGURATION MANAGEMENT
- COST
  - PRODUCTION - SECOND SOURCE
  - SOURCE AND APPLICATION OF FUNDS

SLIDE #5 OFF

SLIDE #6 ON

- RELIABILITY AND MAINTAINABILITY
- QUALITY
- TRAINING
- FACILITIES
- COMPUTER RESOURCES
- ENERGY
- HEALTH AND SAFETY

SLIDE #6 OFF

- THE PLANT OFFICE SHOULD ACT AS COORDINATOR BOTH INTERNALLY AND EXTERNALLY.

SLIDE #7 ON

- INTERNAL COORDINATION WITHIN THE INDUSTRIAL DIVISION (MANUFACTURING) AND ACROSS FUNCTIONS WITH QUALITY, CONTRACTS AND ENGINEERING DIVISIONS TO ASSURE THE APPROPRIATE SKILLS ARE MOBILIZED FOR THE REVIEW TEAM.
- EXTERNAL COORDINATION CONSISTS OF THE CAO TEAM INTERFACING WITH THE CONTRACTOR'S MANAGEMENT FOR CONSOLIDATED SYSTEMS UPDATE ORIENTATION AND FUTURE PRR SUB-TEAM TASK FORCE ASSIGNMENTS.
- EXTERNAL COORDINATION REQUIRES PLANNING AND INTEGRATION OF THE PRODUCTION READINESS REVIEW TEAM WITH THE PLANT OFFICE REPRESENTATIVES AND CONTRACTOR MANAGEMENT.
- THE IMPORTANCE OF THESE COORDINATION EFFORTS CANNOT BE OVEREMPHASIZED IN ORDER TO MAKE THE GREATEST USE OF THE LIMITED TIME THE PRR TEAM HAS AT A GIVEN LOCATION.

SLIDE #7 OFF

SLIDE #8 ON

- THE INITIAL MEETING (GOVERNMENT, NAVPRO, AND PRR TEAM) MUST BE STRUCTURED IN AN EFFICIENT MANNER FOR AN EXECUTIVE SUMMARY OF SIGNIFICANT EVENTS....PARTICULARLY PROBLEM AREAS IN ORDER THAT THE TEAM CAN ZERO IN ON THESE AREAS EARLY AND SURFACE THEM FOR RESOLUTION.
- A SINGLE SPOKESPERSON WITH NAVPRO TEAM BACK-UP FOR CLARIFICATION OF SPECIFIC AREAS OF TECHNICAL EXPERTISE IS HIGHLY EFFECTIVE.
- THE NAVPRO TEAM CAN BE INVALUABLE TO THE REVIEW EFFORT BY ITS INTENSIVE KNOWLEDGE OF THE CONTRACTOR'S MANUFACTURING CAPABILITY.
- AS OUR FRIEND ON MONDAY NIGHT FOOTBALL SAYS: "TELL IT LIKE IT IS."
- I LIKEN THE PLANT REPRESENTATIVE'S ROLE TO THAT OF THE SYMPHONIC ORCHESTRA CONDUCTOR....NOT ONLY SHOULD THE PLANT REPRESENTATIVE HAVE THE BROAD OVERVIEW OF THE CONTRACTOR'S CAPABILITIES AND POTENTIAL PITFALLS.... BUT ALSO HAVE THE ORCHESTRA LEADER'S DETAILED KNOWLEDGE OF THE INDIVIDUAL AND COLLECTIVE INSTRUMENTS TO DIRECT A HARMONIOUS SYMPHONY THAT FOLLOWS THE SCORE OR PLAN FOR A SUCCESSFUL EXECUTION TO RECEIVE THE PLAUDITS OF THE CUSTOMERS.

SLIDE #8 OFF

- LET'S REVIEW SOME OF THE MORE IMPORTANT ELEMENTS THAT THE FIELD ACTIVITY MUST BE ON TOP OF FOR A SUCCESSFUL PRR.

SLIDE #9 ON

- PRODUCIBILITY
  - WHAT IS THE CONTRACTOR'S MAKE OR BUY STRUCTURE?
  - WHAT CONTROLS ARE MAINTAINED ON THE SUBCONTRACTOR/VENDOR NETWORK?
  - DUAL SOURCING OF CRITICAL SUPPLIERS AND CONSEQUENT DUAL TOOLING COSTS FROM A RISK ASSESSMENT VIEWPOINT.

- MANAGEMENT/LABOR EXPIRATION DATES FOR KEY SUPPLIERS.
- HARD-TO-OBTAIN (LONG LEAD) RAW MATERIALS.
- MANUFACTURING CYCLE TIMES - LEAD TIMES - QUEUING!

SLIDE #9 OFF

SLIDE #10 ON

- CAPITAL INVESTMENT
  - ACQUISITION OF N/C, EDM EQUIPMENT.
  - GOVERNMENT ACQUISITION OF CAPITAL EQUIPMENT - VIS A VIS OUTSIDE MANUFACTURING COST TRADEOFF....DOWNSIDE RISK....RETURN ON INVESTMENT.... DOD POLICY QUESTIONS.
  - IN THIS REGARD IT IS IMPERATIVE THAT WE KNOW THE CONTRACTOR'S COMMERCIAL AND FMS BUSINESS PLANS IN ADDITION TO THE MILITARY REQUIREMENTS.
  - FOR IF WE ARE PARTNERS IN A JOINT VENTURE, LET'S BE FULL PARTNERS AND ASSESS THE ENTIRE BUSINESS PLAN IN ORDER TO MAKE A COMPLETE MANUFACTURING EVALUATION.

SLIDE #10 OFF

SLIDE #11 ON

- CURRENT AND PAST EXPERIENCE: LESSONS LEARNED FROM PREVIOUS PROBLEMS.... WHAT WERE OR ARE THE UNDERLYING REASONS FOR THE PROBLEMS?...HAVE THEY BEEN CORRECTED?...CAN THEY BE AVOIDED IN THE FUTURE?
- WHAT SHIFT LEVELS ARE PLANNED?...WHAT OVERTIME CONSIDERATIONS WERE ASSESSED?
- WHAT IS THE MANUFACTURING CAPACITY?...MACHINE LOADING LEVELS?...EXPANSION CAPABILITIES?
- WHAT IS THE CONTRACTOR'S CAPITAL OUTLAY PLANS?...THEIR FIVE YEAR AND 10 YEAR PLANS?
- WHERE IS THE CONTRACTOR'S LABOR DRAWN FROM?...IS IT AVAILABLE?

- WHAT ARE THE TRAINING PROGRAMS?...ARE THEY ADEQUATE!

SLIDE #11 OFF

SLIDE #12 ON

- WHAT LOGISTICAL CAPABILITIES DOES HE HAVE?...FIELD ORGANIZATION?...  
SPARES SUPPORT?...ADP CAPABILITIES?
- REVIEW OF THE CONTRACTOR'S KEY MANAGERS ASSIGNMENTS TO THE PROGRAM....  
WHAT IS THE MANAGEMENT ORGANIZATIONAL NETWORK?...HOW DOES IT WORK?...WHAT  
ASSURANCE DO WE HAVE OF MAINTAINING CONTINUITY OF ASSIGNMENT WITH KEY MANAGERS?
- HOW IS LAYOUT, WORKFLOW, METHODS AND STANDARDS INSTITUTED AND MAINTAINED?
- HOW IS THE TRANSPORTATION AND PACKAGING SYSTEMS MANAGEMENT PLANNED?
- HOW HAS THE CONTRACTOR PLANNED THE ASSEMBLY AREA(S)?

SLIDE #12 OFF

SLIDE #13 ON

- HOW ARE PROPERTY, PLANT CLEARANCE AND INDUSTRIAL RESOURCES FUNCTIONS  
ACCOMMODATED?...SURGE PLANNING CAPABILITIES?
  - ASPO
  - GFP
  - GFE
- TOOLING - NEED CLASSIFICATION....PRIME VENDOR....RATE....COMPONENT  
IMPROVEMENT.

SLIDE #13 OFF

SLIDE #14 ON

- ADEQUACY AND CAPACITY OF TEST AREAS AND ASSOCIATED EQUIPMENT.
  - VENDORS - QPL, ETC.
- HAS ANY PLANNING BEEN DONE FOR TRANSITION AND DOVE TAILING WITH SHIFTS  
IN THE MAKE OR BUY STRUCTURE.

- IS C<sup>2</sup> IS A CONSIDERATION....IF IT IS APPROPRIATE - REVIEWS.
- FLIGHT SAFETY PROVISIONS.

SLIDE #14 OFF

SLIDE #15 ON

- HOW DOES THE CONTRACTOR ACCOMPLISH AND MANAGE HIS VERTICAL AND HORIZONTAL PLANNING?
  - HAS PLANNING INCLUDED WORK AROUNDS FOR BOTTLENECK SCENARIOS?
  - HOW DOES THE CONTRACTOR MANAGE "SHOW STOPPERS."

DOES THE CONTRACTOR HAVE A MASTER PLAN INTEGRATED TO LOWER LEVELS?...  
 WITH A DISCIPLINED PROGRESS TRACKING SYSTEM?...WHAT IS THE FREQUENCY OF  
 REVIEW AND UPDATE?...CORRECTIVE ACTIONS?...DOES IT PINPOINT RESPONSIBILITIES?
- ARE PROCEDURES DOCUMENTED?...HOW ARE THEY CONTROLLED AND CHANGED?...  
 WHAT COMPLIANCE TECHNIQUES ARE UTILIZED?...WATCH OUT FOR THE SHORT CUTS,  
 PARTICULARLY THE DIRE EMERGENCY ONES.

SLIDE #15 OFF

SLIDE #16 ON

- TOP-LEVEL MANAGEMENT INVOLVEMENT AND COMMITMENT.
  - E.G. OPEN ACTION ITEMS AT CONCLUSION OF THE PRR.
- COMMUNICATIONS....MATRIX MANAGEMENT....NAVY AND CONTRACTOR....FEEDBACK  
 LOOP TO PROGRAM PEOPLE.
  - ALL THE KNOWLEDGE IN THE WORLD WON'T DO ANYTHING IF IT'S NOT  
 COMMUNICATED BACK TO PROGRAM MANAGERS.
- HOW WILL THE INTEGRATION OF THE AIRCRAFT ENGINE MANUFACTURE TAKE PLACE  
 WITH THE SYSTEMS' CONTRACTOR AND AIRFRAMER?
- CONTRACTS' PEOPLE ARE IMPORTANT!...THEY KEEP AS ALL HONEST!...STAY  
 WITHIN THE FOUR CORNERS OF THE CONTRACT OR WORK WITH THE PROGRAM MANAGER TO  
 CHANGE THE CONTRACT.

- BEWARE OF CONSTRUCTIVE CHANGES!
- BEWARE OF PRE-CONTRACT COST!

SLIDE #16 OFF

SLIDE #17 ON

- ADVANCE FUNDING....LONG-LEAD ITEMS....QUEUEING!
- KEEP THE COST DOWN!
- KEEP THE QUALITY UP!
- ENGINEERING CHANGES AND CONFIGURATION MANAGEMENT.
- COMPLIANCE TO DRAWINGS AND SPECIFICATIONS.

SLIDE #17 OFF

SLIDE #18 ON

- MRB, REWORK, SCRAP - ACTIVITIES CAN BE DIAGNOSTIC INDICATIONS OF PROBLEM AREAS....OR IF THERE IS LITTLE TO NONE HAS IT GONE UNDERGROUND?

SLIDE #18 OFF

SLIDE #19 ON

- IN CONCLUSION THEN, THE PLANT OFFICE MUST BE AWARE OF THESE SIGNIFICANT AREAS OF CONCERN....MUST ACCOMPLISH THE NECESSARY INTERNAL AND EXTERNAL COORDINATION....DEVELOP AN EXECUTIVE BRIEF FOR THE GOVERNMENT MEETING SURFACING ACTUAL AND POTENTIAL PROBLEM AREAS AND PARTICIPATE ACTIVELY IN A CRITICAL REVIEW OF THE PROGRAM.

SLIDE #19 OFF

- FINALLY, LET'S CLOSE WITH A QUOTE FROM JOHN LOCKE.

"I ATTRIBUTE THE LITTLE I KNOW TO MY NOT HAVING BEEN ASHAMED TO ASK FOR INFORMATION, AND TO MY RULE OF CONVERSATION WITH ALL DESCRIPTIONS OF MAN ON THOSE TOPICS THAT FORM THEIR OWN PECULIAR PROFESSIONS AND PURSUITS."

NAVPRO LYNN

- WE WHO PARTICIPATE IN THE PRODUCTION READINESS REVIEW PERFORM  
IN THE ROLE OF A CRITIC

NAVPRO LYNN

- PURPOSE OF THE REVIEW
- MINIMIZE FUTURE RISKS
- MBO
- ATTITUDE

NAVPRO LYNN

- PLANNING
- SIGNIFICANT REVISIONS TO DOD DIRECTIVES 5000.1 AND 5000.2
  - STREAMLINE ACQUISITION PROCESS
  - PINPOINT RESPONSIBILITIES

NAVPRO LYNN

- DOD DIRECTIVE 5000.1
  - AFFORDABILITY
  - ACQUISITION TIME
  - STANDARDIZATION
  - LOGISTIC SUPPORTABILITY

NAVPRO LYNN

- INITIAL PLANNING STATEMENT (IPS)
  - COST EFFECTIVENESS ANALYSIS
  - ORGANIZATIONAL/OPERATIONAL CONCEPT
  - CONFIGURATION MANAGEMENT
  - COST
    - PRODUCTION - SECOND SOURCE
    - SOURCE APPLICATION OF FUNDS

NAVPRO LYNN

- IPS CHANGES (CONTINUED)
  - RELIABILITY AND MAINTAINABILITY
  - QUALITY
  - TRAINING
  - FACILITIES
  - COMPUTER RESOURCES
  - ENERGY
  - HEALTH AND SAFETY

NAVPRO LYNN

- COORDINATION
  - INTERNAL
  - EXTERNAL

NAVPRO LYNN

- INITIAL GOVERNMENT MEETING
  - EXECUTIVE SUMMARY
  - SURFACE PROBLEM AREAS
  - SINGLE SPOKESPERSON
  - NAVPRO'S CORPORATE KNOWLEDGE

#### NAVPRO LYNN

- PRODUCIBILITY
  - MAKE OR BUY STRUCTURE
  - SUBCONTRACTOR/VENDOR
  - DUAL SOURCING
  - MANAGEMENT/LABOR EXPIRATION DATES
  - HARD-TO-OBTAIN (LONG LEAD) ITEMS
  - MANUFACTURING CYCLES

#### NAVPRO LYNN

- CAPITAL INVESTMENT
  - NUMERICAL CONTROL AND ELECTRONIC DISCHARGE EQUIPMENT
  - GOVERNMENT OWNERSHIP
  - DOD POLICY QUESTIONS
  - CONTRACTOR'S TOTAL BUSINESS PLANS

NAVPRO LYNN

- CURRENT AND PAST EXPERIENCE
- SHIFT LEVELS
- MANUFACTURING CAPACITY
- CONTRACTOR'S FIVE/TEN YEAR PLANS
- LABOR DRAW
- TRAINING PROGRAMS

NAVPRO LYNN

- LOGISTICAL CAPABILITIES
- KEY MANAGERS
- LAYOUT/WORKFLOW/METHODS AND STANDARDS
- TRAFFIC AND PACKING MANAGEMENT
- ASSEMBLY AREAS

#### NAVPRO LYNN

- PROPERTY/PLANT CLEARANCE/INDUSTRIAL RESOURCES
  - ASPO - SURGE PLANNING
  - GFP
  - GFE
- TOOLING
  - NEED AND CLASSIFICATION
  - PRIME/VENDOR
  - RATE
  - COMPONENT IMPROVEMENT

#### NAVPRO LYNN

- TEST EQUIPMENT
  - VENDOR QPL
- PLANNING ELASTICITY FOR CHANGES IN MAKE OR BUY SHIFTS
- C<sup>2</sup> - REVIEWS
- FLIGHT SAFETY REQUIREMENTS

#### NAVPRO LYNN

- VERTICAL AND HORIZONTAL PLANNING
  - WORKAROUNDS
  - SHOW STOPPERS
- MASTER PLAN
- DOCUMENTATION OF PROCEDURES

#### NAVPRO LYNN

- TOP-LEVEL MANAGEMENT INVOLVEMENT AND COMMITMENT
- COMMUNICATIONS
- INTEGRATION WITH SYSTEMS AND AIRFRAMERS
- CONTRACTING OFFICER KEPT INFORMED
  - BEWARE OF CONSTRUCTIVE CHANGES
  - BEWARE OF PRE-CONTRACT COSTS

#### NAVPRO LYNN

- ADVANCE FUNDING/LONG-LEAD ITEMS/QUEUING
- KEEP THE COST DOWN!
- KEEP THE QUALITY UP!
- ENGINEERING CHANGES/CONFIGURATION MANAGEMENT
- COMPLIANCE TO DRAWINGS AND SPECIFICATIONS

#### NAVPRO LYNN

- MATERIAL REVIEW BOARD (ACTIONS)
- REWORK
- SCRAP

### NAVPRO LYNN

- CONCLUSION
  - SIGNIFICANT AREAS OF CONCERN
  - COORDINATION
    - INTERNAL
    - EXTERNAL
  - EXECUTIVE SUMMARY
    - SURFACE PROBLEM AREAS
  - PARTICIPATE ACTIVELY IN THE REVIEW

# CRUISE MISSILES PRODUCTION READINESS



**19-20 NOVEMBER 1980**

**MAJOR DON ALDUCIN  
DIRECTOR, PRODUCTION DIVISION  
JOINT CRUISE MISSILES PROJECT OFFICE**

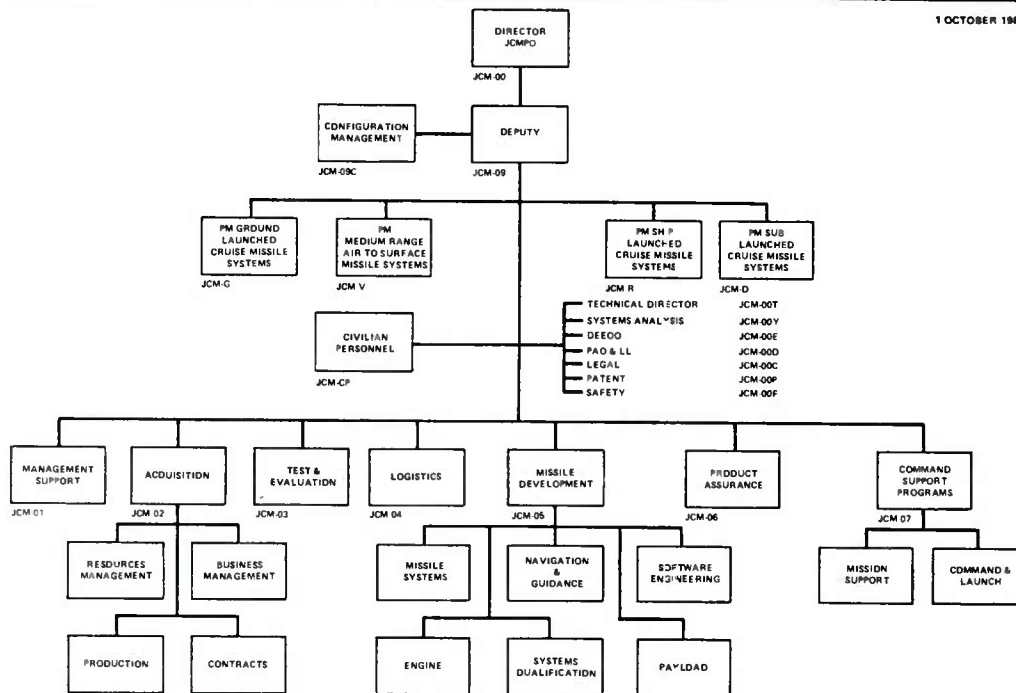
SLIDE 1  
TITLE

- GOOD MORNING, I'M MAJOR DON ALDUCIN, DIRECTOR OF PRODUCTION, JOINT CRUISE MISSILES PROJECT, (JCMP) WASHINGTON, D.C. ON BEHALF OF RADM W. LOCKE AND ALL THE MEMBERS OF THE JCMP I APPRECIATE SHARING WITH YOU THE CRUISE MISSILES PRODUCTION READINESS APPROACH AND LESSONS LEARNED.
- I REMEMBER APPLYING FOR AIR FORCE OFFICER TRAINING SCHOOL AND THE SERGEANT ASKING, "DID YOU COMPLETE HIGH SCHOOL?" "YES, SIR, " I SAID, " I GRADUATED CUM LAUDE FROM COLLEGE, AND HAVE COMPLETED SEVERAL HOURS OF GRADUATE STUDIES." THE SERGEANT NODDED, REACHED FOR A RUBBER STAMP, AND SLAPPED IT ON THE QUESTIONNAIRE. IT CONSISTED OF A SINGLE WORD: "LITERATE."
- I GUESS BECAUSE I WAS CLASSIFIED BY THE AIR FORCE AS "LITERATE" IT ALSO QUALIFIED ME TO SERVE AS A PRR TEAM CHIEF.
- THIS MORNING I'M GOING TO PROVIDE A CAPSULE SUMMARY OF THE JCMP ORGANIZATION, HOW THE JOINT OFFICE WAS ESTABLISHED, ITS' LINE OF AUTHORITY, THE EXCOM, AN OVERVIEW OF THE FAMILY OF CRUISE MISSILES, AND THEIR CHARACTERISTICS. HOWEVER, I WILL PRINCIPALLY CONCENTRATE ON: PRRs/PLANNING FOR RATE (PFRRs), GUIDELINES, TEAM STRUCTURE, AREAS EVALUATED, ASSESSMENT METHODS, INCREMENTAL SCHEDULE, SUBCONTRACTOR PRR PROGRAM, CONTRACTORS GEOGRAPHIC DISTRIBUTION, PRR/PFRR FLOW CYCLE, AND I'LL CLOSE MY TALK CONCENTRATING ON LESSONS LEARNED FROM THE NUMEROUS CONDUCTED TO DATE.



# JOINT CRUISE MISSILES PROJECT OFFICE

1 OCTOBER 1980



## SLIDE 2 JCMPPO ORGANIZATION

- THE JOINT CRUISE MISSILES PROJECT OFFICE (JCMPPO) IS A DOD CHARTER JOINT NAVY AND AIR FORCE PROJECT. THERE ARE A TOTAL OF 275 EMPLOYEES. AIR FORCE - MILITARY 74 CIVILIANS 15, NAVY - MILITARY 34 CIVILIANS 150. RADM WALTER LOCKE IS THE DIRECTOR AND COL. ALLAN CHASE IS THE DEPUTY DIRECTOR. THE JCMPPO IS LOCATED IN CRYSTAL CITY ON THE 11TH/12TH FLOORS OF NATIONAL CENTER ONE.



## PROGRAM DIRECTION

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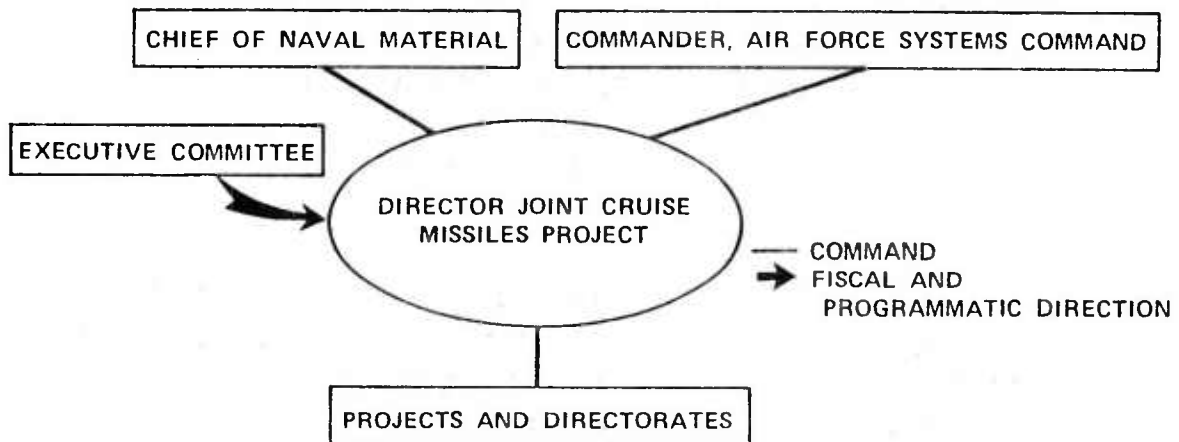
- 1977 JOINT ALCM/SLCM DSARC II DIRECTION
  - ALCM AND SLCM DSARC II DIRECTION
  - ESTABLISHED JCMPO — NAVY LEAD
  - COMMONALITY IN ENGINE, NAVIGATION/  
GUIDANCE, WARHEAD
- 30 SEPTEMBER 1977 DDR&E MEMORANDUM
  - RECONSTITUTED JCMPO
  - DIRECTED ALCM COMPETITION
  - ESTABLISHED EXECUTIVE COMMITTEE

### SLIDE 3 PROGRAM DIRECTION

- THE DSARC II ESTABLISHED THE JCMPO, DESIGNATING THE USN AS THE LEAD SERVICE. THIS DSARC II DIRECTED THAT JCMPO STRIVE FOR COMMONALITY IN THE ENGINES, NAVIGATION/GUIDANCE AND WARHEAD FOR THE AIR FORCE AND NAVY MISSILES UNDERGOING FULL SCALE ENGINEERING DEVELOPMENT. ALSO DIRECTED THE DEVELOPMENT OF GLCM TO MEET AIR FORCE REQUIREMENT USING NAVY TOMAHAWK MISSILE.
- THE DDR&E MEMORANDUM DATED 30 SEPTEMBER 1977 RECONSTITUTED THE JCMPO AND LOCATED THE ALCM/GLCM/SLCM PROGRAMS WITHIN THE JCMPO IN WASHINGTON, D.C. THIS MEMORANDUM DIRECTED A COMPETITION OF THE ALCM AND ESTABLISHED THE EXECUTIVE COMMITTEE.
- THE ALCM DSARC III CONVENED IN MAY 1980 AND DIRECTED THAT SYSTEM INTO FULL RATE PRODUCTION, AND THE ALCM AIRFRAME WAS DIRECTED BACK TO THE AIR FORCE'S AERONAUTICAL SYSTEMS DIVISION FOR PRODUCTION MANAGEMENT; HOWEVER, THE COMMON ENGINE AND NAVIGATION/GUIDANCE SYSTEMS WERE DIRECTED TO BE CONTINUED TO BE MANAGED BY THE JCMPO TO INSURE THAT MAXIMUM COMMONALITY BE MAINTAINED IN THE SUBSYSTEMS FOR ALL CRUISE MISSILES.



## ORGANIZATIONAL LINES OF AUTHORITY



SLIDE 4  
ORGANIZATIONAL LINES OF AUTHORITY

- THE JCMPO IS A DOD CHARTERED ORGANIZATION. THE NAVY HAS BEEN DIRECTED TO PROVIDE ADMINISTRATIVE SUPPORT. THE ORGANIZATION IS ADMINISTRATIVELY ASSIGNED TO NAVMAT, DESIGNATED JPM-3; HOWEVER, RADM LOCKE RECEIVES HIS COMMAND DIRECTION FROM ADM WHITTLE, CHIEF OF NAVMAT FOR NAVY SYSTEMS AND GENERAL SLAY, COMMANDER AIR FORCE SYSTEMS COMMAND FOR AIR FORCE SYSTEMS. ALL FISCAL AND PROGRAMMATIC DIRECTION COMES FROM THE EXECUTIVE COMMITTEE (EXCOM).



# JOINT CRUISE MISSILES PROJECT EXCOM

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## MEMBERSHIP:

### OSD

UNDER SECDEF (R&E) CHAIRMAN

AST SECDEF (PA&E)

AST SECDEF (COMPT)

### NAVY

VCNO

AST SECNAV (RE&S)

CHNAVMAT

### AIR FORCE

VCSAF

AST SECAF (RD&L)

CMDR, AF SYSCOM

### ARMY

AST SA (RD&A)

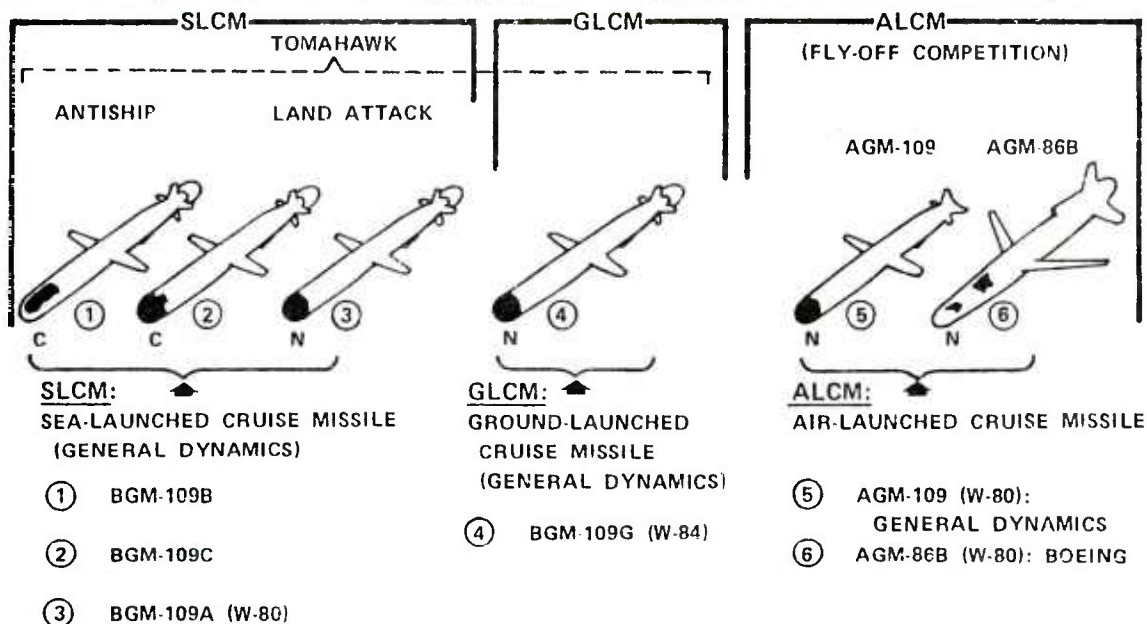
SLIDE 5

EXCOM

- THE EXCOM MEETS PERIODICALLY, BUT NOT LESS THAN EVERY TWO MONTHS TO REVIEW THE PROGRAM STATUS OF THE DEVELOPMENT AND PRODUCTION PROGRESS OF ALL THE CRUISE MISSILES PROGRAMS. THE EXCOM IS CHAIRED BY DR. BILL PERRY, UNDER SECRETARY RESEARCH AND ENGINEERING AND THOSE REPRESENTED ON THE CHART.



# CRUISE MISSILE FAMILY



"TOMAHAWK": NAME FOR GENERAL DYNAMICS SLCM/GLCM CRUISE MISSILES  
 N: NUCLEAR ARMED C: CONVENTIONAL ARMED

## SLIDE 6 CRUISE MISSILES FAMILY

- THERE ARE PRESENTLY 12 DIFFERENT VARIANTS FOR THE CRUISE MISSILES EITHER UNDER DEVELOPMENT OR IN FULL PRODUCTION. THE BOEING AGM-86B IS ONLY SYSTEM PRESENTLY IN RATE PRODUCTION. EACH OF THESE SYSTEMS ARE BRICK-BAT DX-A2 RATED. (HIGHEST NATIONAL DEFENSE PRIORITY RATING)



# CRUISE MISSILE

---

UNMANNED, SELF-PROPELLED  
GUIDED WEAPON-DELIVERY VEHICLE  
WHICH SUSTAINS FLIGHT THROUGH  
THE USE OF AERODYNAMIC LIFT  
OVER MOST OF ITS FLIGHT PATH.

SLIDE 7  
CRUISE MISSILE

- UNMANNED SELF PROPELLED GUIDED WEAPON WITH A SUBSONIC F107 GAS TURBINE ENGINE WITH 600 LBS OF THRUST. THE RANGE IS IN EXCESS OF 1500 MILES OR 2,500 KILOMETERS.



## **U.S. CRUISE MISSILE CHARACTERISTICS**

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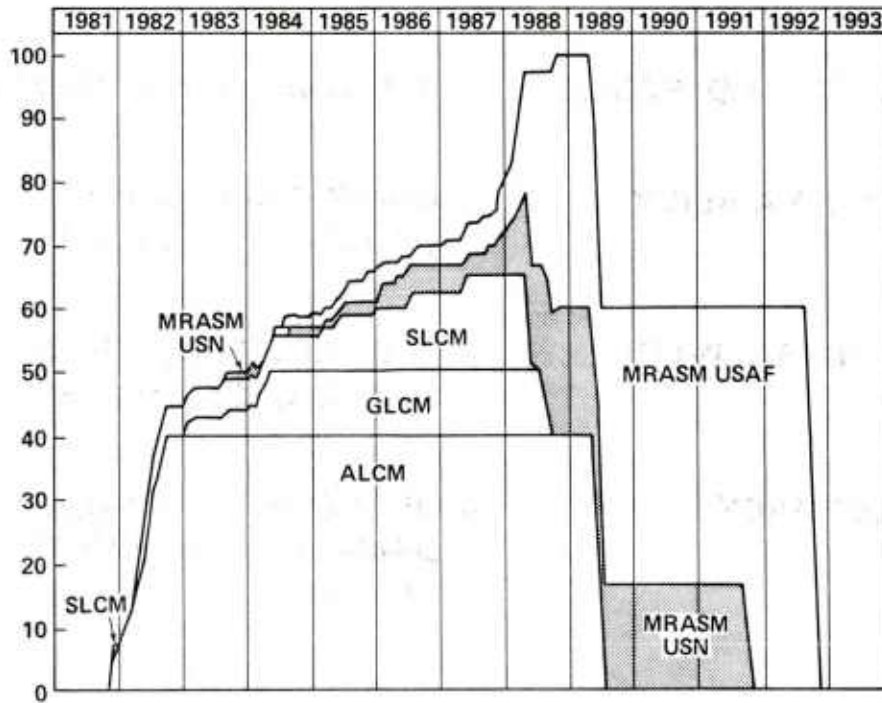
- **SPEED AND RANGE**      – **SUBSONIC, LONG RANGE**
- **SURVIVABILITY**      – **DIVERSIFIED SURVIVABLE  
LAUNCH PLATFORMS**
- **PENETRATIVITY**      – **LOW ALTITUDE CRUISE,  
SMALL OBSERVABLES**
- **ACCURACY**      – **NUCLEAR, LOW COLLATERAL  
DAMAGE; CONVENTIONAL  
EFFECTIVE**

SLIDE 8  
CHARACTERISTICS

AS OUTLINED



# CRUISE MISSILE REQUIREMENTS



\* LONG RANGE PROGRAM (BEYOND FYDP)

## SLIDE 9 PRODUCTION QUANTITIES

ALCM - 3583  
 SLCM - 614  
 GLCM - 610  
 MRASM - 3500  
 TOTAL - 8307



# **CRUISE MISSILE PRODUCTION READINESS REVIEW (PRR) OVERVIEW**

---

- **PRR/PFRR OBJECTIVES**
- **GUIDELINES**
- **TEAM STRUCTURE**
- **AREAS EVALUATED**
- **ASSESSMENT METHOD/CODE**
- **PRR/PFRR INCREMENTAL SCHEDULE**
- **MAJOR SUBCONTRACTOR PRRs**
- **GEOGRAPHIC DISTRIBUTION**
- **FLOW CYCLE**
- **LESSONS LEARNED**

SLIDE 10  
OVERVIEW

AS OUTLINED



## **CRUISE MISSILE (CM) PRODUCTION READINESS REVIEW OBJECTIVES**

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- ENSURE THAT THE CM CONTRACTORS, EACH ASSOCIATE CONTRACTOR, AND KEY SUBCONTRACTORS ARE READY FOR PRODUCTION THAT SATISFIES IDENTIFIED PERFORMANCE AND SCHEDULE REQUIREMENTS
- ENSURE ALL SIGNIFICANT PRODUCTION ENGINEERING PROBLEMS ENCOUNTERED DURING DEVELOPMENT HAVE BEEN RESOLVED
- ENSURE THE ACCOMPLISHMENT OF ADEQUATE PLANNING AND PREPARATION FOR THE TRANSITION FROM DEVELOPMENT TO PRODUCTION

SLIDE 11  
OBJECTIVES

- o THESE ARE THE THREE MAJOR OBJECTIVES OF THE CRUISE MISSILES PRRs.



## GUIDELINES FOR CONDUCTING REVIEWS

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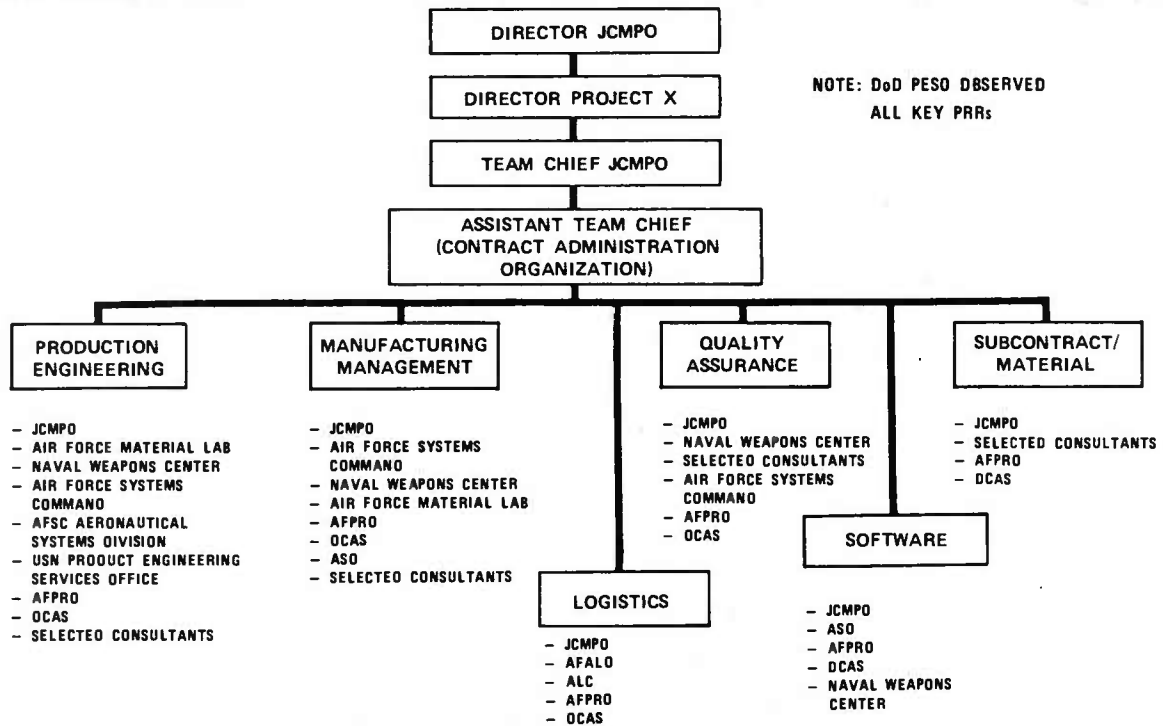
- JCMP PRR/PFRR PLAN
- DoDI 5000.38
- COORDINATED AGENDAS
- JOINT SERVICE TEAMS

### SLIDE 12 GUIDELINES

- THE REASON THE JCMP HAS BEEN AS SUCCESSFUL IN ACHIEVING MAXIMUM PRODUCTION READINESS IS BECAUSE OF THE DETAILED PLANNING THAT HAS BEEN ACCOMPLISHED. NUMEROUS UPDATES HAVE BEEN PREPARED TO THE JCMP PRR/PFRR PLAN. THE JCMP FOLLOWS THE DODI 5000.38 ALMOST TO THE LETTER. THE KEY FEATURE OF THE CRUISE MISSILE PROCESS IS THAT THERE IS A DETAILED COORDINATED AGENDAS WITHIN THE PROJECT AND THEN WITH THE CONTRACTOR TO INSURE THERE IS MAXIMUM UNDERSTANDING OF WHAT IS TO BE REVIEWED. THE JCMP HAS BEEN ABLE TO OBTAIN SOME OF THE BEST INDUSTRIAL CONSULTING EXPERTS FROM INDUSTRY AND THE GOVERNMENT TO CONDUCT THE REVIEWS.



# CRUISE MISSILES PRODUCTION READINESS REVIEW TEAM STRUCTURE



SLIDE 13  
TEAM STRUCTURE

- THE CHARTS REFLECT WHAT A TYPICAL TEAM LOOKED LIKE DURING THE ALCM PRR AT THE AIR VEHICLE CONTRACTORS REVIEW.
- THE TEAMS WERE ANYWHERE FROM 35 INDIVIDUALS TO A MAXIMUM OF 55 PEOPLE. DOD PESO WAS ALWAYS INVITED TO PARTICIPATE AS AN OBSERVER WHERE DESIRED.



## **PRODUCTION READINESS REVIEWS KEY AREAS EVALUATED**

---

- **PRODUCTION ENGINEERING**
  - FACILITIES PLAN
  - TOOLING PROGRAM
  - PRODUCT FLOW
  - PRODUCIBILITY PROGRAM
  - MANPOWER PLANNING
  - LOAD CAPACITY PLANNING
- **MANUFACTURING MANAGEMENT SYSTEMS**
  - PRODUCTION MANAGEMENT
  - WORK MEASUREMENT
  - CONFIGURATION MANAGEMENT
  - SCHEDULING/PRODUCTION CONTROL



## **PRODUCTION READINESS REVIEWS KEY AREAS EVALUATED (Cont'd)**

---

- **QUALITY ASSURANCE**
  - Q.A. SYSTEM
  - Q.A. PROGRAM PLAN
  - Q.A. ORGANIZATION
  - CORRECTIVE ACTION SYSTEM
- **SUBCONTRACTS**
  - MAKE OR BUY STRUCTURE
  - PROCUREMENT SYSTEMS
  - SUBCONTRACTOR PRODUCTION  
READINESS REVIEWS
  - SUBCONTRACT MANAGEMENT



# PRODUCTION READINESS REVIEWS

## KEY AREAS EVALUATED (Cont'd)

---

- LOGISTICS
  - TECH ORDERS
  - OPERATIONAL SUPPORT
  - LOGISTICS SUPPORT ANALYSIS
  - PROVISIONING/SPARES
- SOFTWARE
  - OPERATIONAL/MISSION PLANNING
  - TEST EQUIPMENT
  - SOFTWARE INTEGRATION
  - FLIGHT TEST

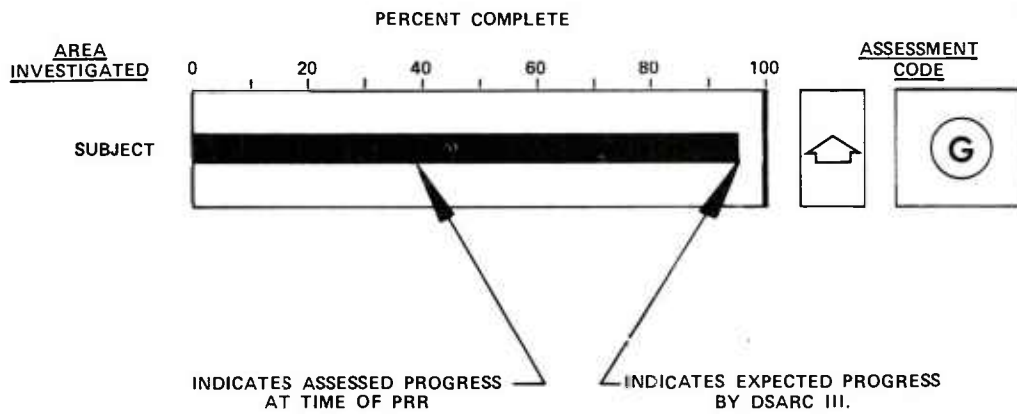
SLIDE 14/15/16  
AREAS EVALUATED

- THE NEXT THREE CHARTS REFLECT PRINCIPAL AREAS COVERED BY THE PANEL DURING THE PRR'S.
- THE TYPICAL CRUISE MISSILE PRR WOULD COMMENCE ON MONDAY MORNING AT 0800 HOURS AT THE CONTRACTORS' PLANT. A GOVERNMENT TEAM WOULD CONVENE FOR APPROXIMATELY 30 MINUTES TO DISCUSS ADMINISTRATIVE PROCEDURES. THEN AT 0830 HRS. A MEETING WOULD CONSIST OF ALL PANELS AND THE CONTRACTOR TO GO OVER THE LATEST PROGRAM STATUS PRINCIPALLY CONCENTRATED ON THE DEVELOPMENT EFFORT PRODUCTION PLAN IMPLEMENTATION. THIS FIRST SESSION WOULD GENERALLY COVER THREE HOURS. AFTER LUNCH THE PANELS WOULD COVER THEIR ASSIGNED AREAS. MANY PANELS WOULD BE JOINTLY SCHEDULED THROUGHOUT THE WEEK. THE DETAILED REVIEWS WOULD BE SCHEDULED TO BE COMPLETE BY 1200 HOURS ON THURSDAY. DURING THAT AFTERNOON EACH PANEL WOULD PRESENT THEIR FINDINGS TO THE TEAM CHIEF. THIS WOULD BE IN THE FORM OF A BRIEFING COVERING THE AREAS EVALUATED. IT WOULD IDENTIFY THE CONTRACTORS MAJOR STRENGTHS AND WEAKNESSES. EACH AREA WOULD BE EVALUATED AS TO THE AMOUNT OF PROGRESS MADE FOR THAT REVIEW WITH AN ASSESSMENT COLOR CODE. LATER IN THE AFTERNOON THE BRIEF WOULD BE REVIEWED BY THE PROGRAM MANAGER FOR HIS CONCURRENCE. THE CONTRACTORS GRAPHICS PERSONNEL WOULD BE REQUESTED TO PREPARE THE VUEGRAPHS AND HARD COPIES OF THE PRESENTATION THAT EVENING. FRIDAY MORNING THE CHARTS WOULD BE REVIEWED AT ABOUT 0730 BY EACH PANEL CHAIRMAN. AT 0900 AN EXECUTIVE DE-BRIEFING OF THE RESULTS OF THE PRR WOULD BE GIVEN TO THE TOP EXECUTIVE MANAGEMENT - PRESIDENT AND VICE PRESIDENT LEVEL. THIS BRIEFING WOULD NORMALLY BE ATTENDED BY THE DIRECTOR OR DEPUTY DIRECTOR OF THE JCMP. THIS WOULD BE A FORMAL REVIEW. QUESTIONS WOULD NORMALLY NOT ALLOWED EXCEPT FOR CLARIFICATION. ALL THE DEFICIENCIES WOULD BE WRITTEN UP ON A "REQUEST FOR ACTION" FORM AND CONEYED TO THE CONTRACTOR THRU A CONTRACTING OFFICER LETTER. PRIOR TO DEPARTURE FROM THE CONTRACTORS PLANT ALL ADMINISTRATIVE ACTIONS WOULD HAVE BEEN COMPLETED INCLUDING A WRITTEN NARRATIVE EXECUTIVE SUMMARY. THIS WOULD BE MAINTAINED IN A PRR CASE FILE WITH COPIES OF ALL PRESENTATIONS, REQUEST FOR ACTIONS, AGENDAS, SCHEDULES EXECUTIVE PANEL SUMMARIES AND ANY OTHER PERTINENT DATA. THIS FILE WOULD BE MAINTAINED BY THE EXECUTIVE OFFICER - NORMALLY MY PROGRAM COORDINATOR OR A MILITARY ADMINISTRATIVE OFFICER.



## ASSESSMENT METHOD

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## ASSESSMENT CODE

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- (B) – CONTINGENCY PLANNING AND IMPLEMENTATION HAVE ADDRESSED ALL IDENTIFIED RISKS
  - (G) – NOTHING MAJOR HAS BEEN IDENTIFIED THAT WILL PREVENT THE ACHIEVEMENT OF DESIRED RESULTS
  - (Y) – ADVERSE IMPACTS HAVE BEEN IDENTIFIED THAT WOULD POSSIBLY PREVENT THE ACHIEVEMENT OF DESIRED RESULTS WITHOUT CORRECTIVE ACTION .
  - (R) – SIGNIFICANT ADVERSE IMPACTS HAVE BEEN IDENTIFIED THAT WILL IMPACT THE ACHIEVEMENT OF DESIRED RESULTS WITHOUT IMMEDIATE MANAGEMENT ATTENTION
- 
- ⬆ PROGRESS SINCE THE LAST PRR HAS BEEN BETTER THAN EXPECTED
  - ➡ PROGRESS SINCE THE LAST PRR HAS BEEN SATISFACTORY
  - ⬇ PROGRESS SINCE THE LAST PRR HAS BEEN LESS THAN SATISFACTORY

SLIDE 17/18  
ASSESSMENT METHOD/CODES

- THIS IS HOW WE USE THE BAROMETER SCALE AND COLOR CODE ASSESSMENTS.



# CRUISE MISSILES PRR/PFRR SCHEDULE

	1978						1979												1980											
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
BOEING (BAC)			11 15					6 9					9 13				14 15					ALCM DSARC								
GENERAL DYNAMICS (GDC)			2 6					20 23					23 27				24 1													
McDONNELL DOUGLAS (MDAC)			31 2				LIT TON 22 26						21 24	LSL 5 7	DSARC 2 3	LIT TON 23 26	6 8									LIT TON				DSARC
WILLIAMS (WRC)	20 21			OGDEN 20 25	5 8		12 14					OGDEN 17 15		TCAE 17 25		OGDEN 6 12		TCAE 9 10								TCAE	PRR			

SLIDE 19  
1978/79/80 PRR SCHEDULE

- IT SEEMS LIKE I'VE SPENT MORE TIME IN AIRPORTS AND MOTELS THAN @ HOME. WE ACCOMPLISHED 26 INCREMENTAL PRRs PRIOR TO THE ALCM DSARC III





## MAJOR SUBCONTRACTOR PRRs

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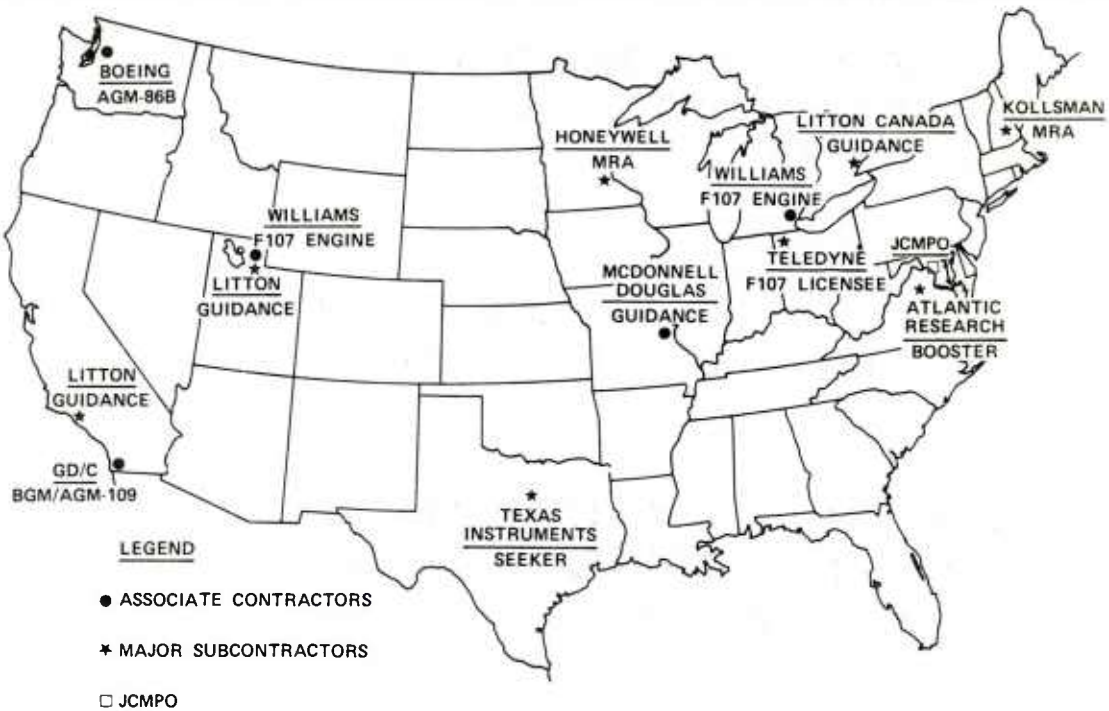
- ASSOCIATE CONTRACTORS RESPONSIBLE FOR CONDUCTING PRRs AT SELECTED SUBCONTRACTORS
- CRITERIA AND METHODOLOGY REVIEWED BY GOVERNMENT PRR TEAM
- SELECTED GOVERNMENT PRR TEAM PERSONNEL ATTENDED SUBCONTRACTOR PRRs AS OBSERVERS/PARTICIPANTS

SLIDE 21  
MAJOR SUBCONTRACTOR PRRs

- EACH OF THE ASSOCIATE CONTRACTORS WERE RESPONSIBLE FOR CONDUCTING PRRs AT THE CRITICAL AND MAJOR SUBCONTRACTORS TO ASSURE THE READINESS OF ALL SUPPLIERS. THE PROGRAM OFFICE RECEIVED THE AGENDAS AND PARTICIPATED DURING MANY REVIEWS. MOST OF THE REVIEWS WERE DELEGATED TO THE CONTRACT ADMINISTRATION OFFICE TO HANDLE THIS PORTION OF THE PRR PROGRAM.



## GEOGRAPHIC DISTRIBUTION CM ASSOCIATE/MAJOR SUBS

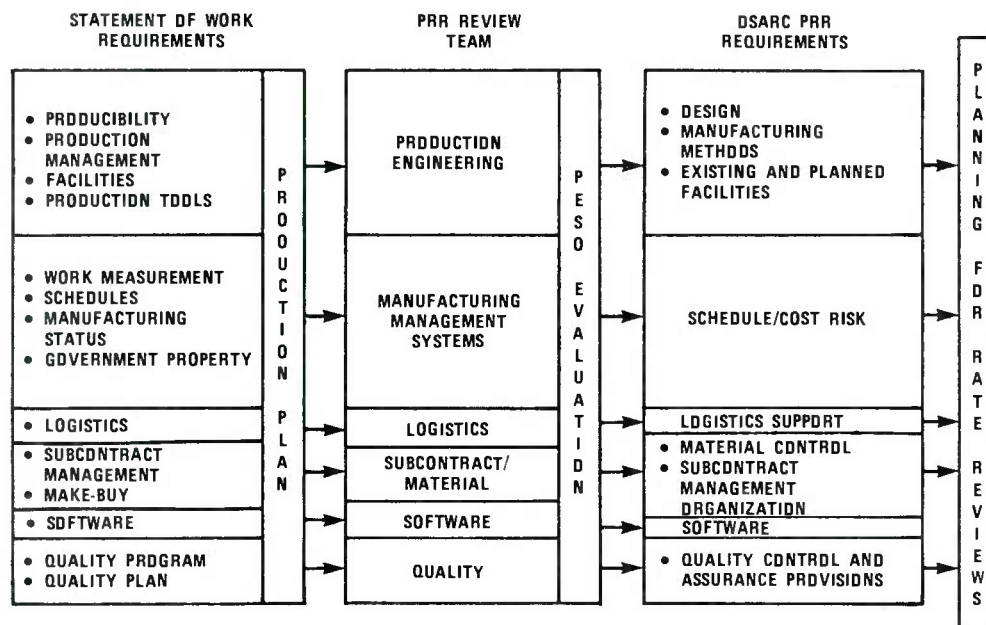


SLIDE 22  
GEOGRAPHIC DISTRIBUTION

● THESE ARE THE MAJOR ASSOCIATE AND CRITICAL MAJOR SUBCONTRACTORS.



# PRODUCTION READINESS FLOW CYCLE



SLIDE 23  
PRODUCTION READINESS FLOW CYCLE

- THIS SLIDE ATTEMPTS TO SHOW HOW THE JCMP STRUCTURED THE PROCESS. FIRST, EACH ASSOCIATE CONTRACTORS CONTRACT HAD REQUIREMENTS IN THE STATEMENT OF WORK COVERED. MOST OF THE AREAS WERE REQUIRED TO BE STATED AS TO THE CONTRACTORS PLAN FOR ACTION IN THE CONTRACT DATA REQUIREMENTS LIST (CDRL) PRODUCTION PLAN. THE NEXT THING WAS TO PUT TOGETHER A PRR TEAM AND THEN INSURE THAT THE AREAS THE DSARC III WAS INTERESTED IN WERE COVERED. THE LAST AREA IS THE ONE THAT WE ACCOMPLISHED EVEN AFTER THE DSARC III. THAT IS THE PLANNING FOR RATE REVIEWS (PRFFs). THIS REVIEW IS TO INSURE THAT RATE IS ATTAINED. IN FACT, I LEAVE THIS EVENING TO ATTEND THE EXECUTIVE DE-BRIEFING AT THE BOEING COMPANY TOMORROW MORNING ON THE AGM-86B. PRFR WHICH IS BEING CONDUCTED BY ASD. THIS WILL BE A FIRST FOR ME. I GET TO JUST LISTEN AS AN OBSERVER FROM THE JCMP.



## **LESSONS LEARNED FROM PRRs**

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- **SIZE OF TEAMS MUST BE LIMITED**
- **DE-EMPHASIZE IMPORTANCE OF THE NUMBER COUNT OF RFRs**
- **PRRs IMPROVED COMMUNICATIONS WITHIN THE CONTRACTOR'S ORGANIZATION**
- **INDUSTRIAL CAPACITY TO SUPPORT DEPLOYED SYSTEM**
- **CONTRACTOR MANPOWER/EQUIPMENT PREDICTION METHODS AND DATA BASE SHOULD BE ASSESSED**
- **USEFULNESS OF SELECTED INDUSTRIAL EXPERTS WITH PREVIOUS EXPERIENCE IN PRIVATE INDUSTRY**
- **JCMP ABILITY TO USE BOTH NAVY AND AIR FORCE RESOURCES**
- **TOP MANAGEMENT INVOLVEMENT AT BOTH PROGRAM OFFICE AND CONTRACTOR**
- **PRODUCTION PLANS SHOULD PROVIDE BASIS FOR THE PRR ASSESSMENT**
- **CONTRACTOR COOPERATION MAY LEAD TO EXPOSING RISK**



## **LESSONS LEARNED FROM PRRs (CONT'D)**

---

- **ACCOMPLISHMENT OF OBJECTIVES**
- **CONTRACTOR PROGRESS TOWARDS PRODUCTION READINESS**
- **CONTACT WITH THE CONTRACTORS MUST BE MAINTAINED BETWEEN PRRs**
- **A DETAILED AGENDA MUST BE PUBLISHED IN ADVANCE OF EACH PRR**
- **LAST INCREMENTAL PRR MUST BE HELD IMMEDIATELY PRIOR TO DSARC III**
- **THERE SHOULD BE CONTINUITY OF PANEL CHAIRMEN**
- **MOST PANEL MEMBERS MUST BE CAREFULLY SELECTED AS TO QUALIFICATIONS**
- **EXPECTED PERFORMANCE STANDARDS SHOULD BE DEFINED PRIOR TO PRRs**



## LESSONS LEARNED FROM PRRs (CONT'D)

---

- **CONTRACTOR'S DECISION - PROCEDURES/PROCESSES DO NOT NORMALLY CONSIDER PRODUCTION COSTS**
- **PRR TEAM MUST VALIDATE THE VU-GRAPH PRESENTATIONS OF DATA THROUGH HARDWARE FLOOR AUDITS**
- **MIL-STD-1528 "PRODUCTION MANAGEMENT" INTERNAL AUDIT REQUIREMENT MUST BE ACCOMPLISHED BY THE CONTRACTORS**
- **DURING PRRs, MUST HAVE DAILY CROSS-PANEL COORDINATION**

### SLIDE 24/25/26 LESSONS LEARNED

- **ACCOMPLISHMENT OF OBJECTIVES.**  
THE INCREMENTAL PRRs DID ENSURE CRUISE MISSILES CONTRACTORS WERE READY FOR PRODUCTION AND PERMITTED THOROUGH ASSESSMENT OF REMAINING PROBLEMS.
- **CONTRACTOR PROGRESS TOWARDS PRODUCTION READINESS.**  
THE INCREMENTAL PRRs ACCELERATED OVERALL CONTRACTOR PROGRESS TOWARDS PRODUCTION READINESS BY EXPOSING PROBLEM AREAS AND THE PROGRESS MADE.
- **CONTACT WITH THE CONTRACTORS MUST BE MAINTAINED BETWEEN PRRs.**  
THE BEST PROGRESS WAS MADE BY THE CONTRACTORS WHEN THERE WERE FOLLOW-UP CONTACTS BY JCMP. THIS ENSURED THAT CONTRACTOR EFFORTS WERE APPLIED ALONG THE PROPER LINES OF DIRECTION. CONVERSELY, THERE WAS ONE INSTANCE WHEN CONTACT WAS LOST WHILE THE CONTRACTOR DRASTICALLY CHANGED PRODUCTION FACILITY PLANNING.
- **A DETAILED AGENDA MUST BE PUBLISHED IN ADVANCE OF EACH PRR.**  
WHEN A DETAILED AGENDA WITH SPECIFIC DIRECTION WAS PROVIDED TO THE CONTRACTOR, ALLOWING PREPARATION TIME FOR THE TOPICS OF INTEREST, THE PRR PROVED MORE PRODUCTIVE THAN WITH A GENERALIZED AGENDA. BOTH GOVT & CONTRACTOR MUST UNDERSTAND THE AGENDA ITEM INTENT OR OBJECTIVE. BROAD INITIAL AGENDA VS CONCENTRATED ON WEAK AREAS I.E. AFSCR 84-2.
- **LAST INCREMENTAL PRR MUST BE HELD IMMEDIATELY PRIOR TO DSARC III.**  
IF THERE IS A LONG PERIOD BETWEEN THE LAST INCREMENTAL PRR AND DSARC III DATA PROVIDED TO DOD WILL BE INACCURATE.
- **THERE SHOULD BE CONTINUITY OF PANEL CHAIRMEN**  
IT IS NECESSARY TO HAVE CONTINUITY OF PANEL MEMBERS TO PROVIDE A CONSISTENT EVALUATION. THE PANEL CHAIRMEN SHOULD BE SELECTED FROM WITHIN THE PROGRAM MANAGEMENT ORGANIZATION TO PROVIDE DAY-TO-DAY CONTACT WITH WORKING LEVEL PEOPLE WITHIN THE PM.

SLIDE 24/25/26  
LESSONS LEARNED (CONT)

- MOST PANEL MEMBERS MUST BE CAREFULLY SELECTED AS TO QUALIFICATION.
- EXPECTED PERFORMANCE STANDARDS SHOULD BE DEFINED PRIOR TO PRR.  
THE ANTICIPATED CONTRACTOR PROGRESS AND STATUS USED FOR THE STANDARDS OF THE ASSESSMENT SHOULD BE DEFINED PRIOR TO EACH PRR
- SIZE OF TEAM MEMBERS MUST BE LIMITED TO WORKABLE NUMBER (5 NOT 50)
- DE-EMPHASIZE IMPORTANCE OF THE NUMBER COUNT OF RFRs.  
IT SHOULD BE IMPRESSED ON THE CONTRACTORS THAT THE NUMBER OF REQUESTS FOR RESPONSE (RFRs) ISSUED AS A RESULT OF THE PRR IS NOT AS IMPORTANT AS THE CONTENT OF THE RFRs. CONSOLIDATE WHENEVER POSSIBLE & CONFINE TO MAJOR ISSUES.
- PRRs IMPROVED COMMUNICATIONS WITHIN THE CONTRACTORS ORGANIZATION.  
BECAUSE OF THE COMPREHENSIVE AND CENTRALIZED NATURE OF THE REVIEWS, COMMUNICATIONS BETWEEN THE INTERNAL FUNCTIONS WERE IMPROVED. DUPLICATION OF WORK AND CROSS-PURPOSE EFFORTS WERE REDUCED.
- INDUSTRIAL CAPACITY TO SUPPORT DEPLOYED SYSTEM (REFURB/RECERT DEPOT)  
THE INCREASED FABRICATION AND ASSEMBLY/TEST LOAD IMPOSED BY RECERTIFICATIONS SHOULD BE EVALUATED BEFORE DSARC III.
- CONTRACTOR MANPOWER/EQUIPMENT PREDICTION METHODS & DATA BASE SHOULD BE ASSESSED.  
THE METHODS AND DATA BASE USED FOR MANPOWER/EQUIPMENT ACQUISITION PLANNING MUST BE EVALUATED AS THE BASIS FOR THE PRODUCTION PLAN.
- USEFULNESS OF SELECTED INDUSTRIAL EXPERTS, PREVIOUSLY IN PRIVATE INDUSTRY.  
THE WEALTH OF PRODUCTION EXPERIENCE POSSESSED BY RETIRED MANUFACTURING EXECUTIVES WITH INDUSTRIAL BACKGROUND WAS VALUABLE IN EVALUATING THE CONTRACTORS PRODUCTION PLANS, SYSTEMS, PROCEDURES

SLIDE 24/25/26  
LESSONS LEARNED (CONT)

- JCMP ABILITY TO UTILIZE BOTH NAVY AND AIR FORCE RESOURCES.  
CHINA LAKE PROVIDED EXPERTISE IN SOLDERING TECHNOLOGY, ALSO PROVIDED THE CHAIRMAN FOR THE PRODUCTION ENGINEERING PANEL. AF MATERIALS LAB ADVANCED COMPUTER AIDED MANUFACTURING PRODUCTIBILITY PROGRESS WITH MANUFACTURING TECHNOLOGY PROJECTS.
- TOP MANAGEMENT INVOLVEMENT AT BOTH PROGRAM OFFICE AND CONTRACTOR.
- PRODUCTION & PLANS SHOULD PROVIDE BASIS FOR THE PRR ASSESSMENT.  
THEY SHOULD BE CUSTOMIZED TO CDRL DID THAT IS FORMATED TO THE PRR AREAS TO BE EVALUATED. THIS DOCUMENT MUST BE A WORKING PLAN FOR BOTH THE CONTRACTOR AND PROGRAM OFFICE.
- CONTRACTOR COOPERATION MAY LEAD TO EXPOSING RISK.  
CERTAIN DEPARTMENTS/FUNCTIONS THAT TEND TO BE COOPERATIVE SHOULD NOT BE PENALIZED WHEN RISK IS EXPOSED.
- CONTRACTORS DECISION-PROCEDURES/PROCESSES DO NOT NORMALLY CONSIDER PRODUCTION COST IN DESIGN-TO-COST PROGRAMS, PRODUCTION COST SHOULD BE A KEY FACTOR IN DECISIONS.
- PRR TEAM MUST VALIDATE THE VUEGRAPH PRESENTATIONS OF DATA THRU HARDWARE FLOOR AUDITS.
- MIL-STD-1528 "PRODUCTION MANAGEMENT" INTERNAL AUDITS REQUIREMENTS MUST BE ACCOMPLISHED BY THE CONTRACTORS IN LIEU OF GOVT PRR TEAM ACCOMPLISHING THIS FUNCTION.
- MUST HAVE DAILY CROSS-PANEL COORDINATION (IN MORNING ONLY) MEETING TO REVIEW MAJOR FINDINGS TO AVOID DUPLICATION AND ENHANCE COHERENCY.



AIR FORCE OVERVIEW  
FOR  
DOD PRR CONFERENCE  
WPAFB OHIO  
20 NOV 80

Good Morning:

This may come as a shock to you, Mr. Baldwin, but under the ground rules that we should delete items that have already been covered - - - the Air Force has nothing to present this morning. So as soon as you wrap up the conclusions we can be on our way home. I've always known the tradition or habit of always putting the Air Force last by saying Army, Navy and Air Force would be a break someday. Glad you didn't break tradition and go in alphabetical order.

Seriously though, the excellent presentations we've heard from the Army, Navy and DCAS make it most difficult to see "having the last word" as being an advantage in this case - - as our wives sometimes think and certainly "saving the best to last" does not logically apply to this situation.

To get down to business, I believe it would be most helpful to your understanding and conserve time if I focus on the unique and key things about the Air Force in regard to PRRs.

1st. The Department of the Air Force delegated all responsibility and authority to HQ AFSC for all manufacturing activities related to weapon systems acquisition. This was accomplished in AFR 800-9 dated 1 Oct 79.

2nd. HQ AFSC spends about \$14 billion per year through 5 Buying Divisions and one Administration Division, who have approximately 680 authorized spaces devoted to looking after manufacturing interests. This includes approximately 400 in HQ AF Contract Management Division at Albuquerque, New Mexico and their AFPROs and about 280 in the buying divisions. Aeronautical Systems Division, here at WPAFB has the most with 165. Electronic Systems Division at Hanscom AFB, MASS has 52, the Armament Division at Eglin AFB, FLA has 27, the Ballistic Missile Organization at Norton AFB, California has 17 and the Space Division at Los Angeles has 16. Both Ballistic and Space activities regularly supplement their work force with consultants, Aerospace and TRW respectively.

3rd. Our buying divisions use matrix or functional management in manufacturing as deemed appropriate by their Commanders.

4th. Our PESO people are located at and under the management of our buying divisions. They are used to conduct any of the reviews and assessments which make up the Air Force Manufacturing Review Program, which will be presented to you in a few minutes by my sidekick, Dan Murphy.

5th. The assessments conducted by our PESO people and other manufacturing staff in the Buying Divisions are considered as being independent manufacturing assessments as they are not conducted under the supervision or control of the program managers.

6th. The independent manufacturing assessments we conduct at Headquarters AFSC place heavy emphasis on very early and very complete planning. In this regard we require the buying divisions to submit PRR plans to us within 90 days after award of FSED. With this emphasis on early and complete planning we can feel safe in completing our independent manufacturing assessments with minimum followup, observation and/or participation in the PRR.

7th. The Air Force has been conducting PRRs for over ten years compared to just a few years for the other services. These have been conducted in accordance with AFSCR84-2, since its issuance in November 1971. It is very similar and the forerunner of DODI 5000.38, which was published in 1979. Despite our long and extensive experience it is clear from all of the presentations yesterday that we can learn a lot from the Army, Navy, DCAS and DOD/PESO experience.

8th. And lastly, we have a unique way of incentivizing our PRR enthusiasts to keep them from becoming over zealous and exceeding their allocated presentation time. We use my wife's timer, which I brought along for an earlier meeting this week, and make it clear that their OER and Merit Pay is in jeopardy if the bell goes off - - and they may as well hang it up if they go on for over five minutes.

Thank you for your attention and at this time it is my pleasure to call on Dan Murphy, who is the other half of the AFSC Huntley, Brinkley, to double time up here and put PRRs in focus with other very important manufacturing reviews that are included in our Manufacturing Review Program.

## PRR CONFERENCE

### PREAMBLE

TO DECIDE OR NOT TO DECIDE, THAT IS THE QUESTION. WHETHER 'TIS. . . .  
AND BY OPPOSING END THEM. 'TIS A CONSUMMATION DEVOUTLY TO BE  
WISHED--AYE THERE'S THE RUB--FOR THERE ARE MILLIONS OF US IN THE  
VALLEY OF DECISION.

AS HUMAN BEINGS, OUR LEGACY IS TO MAKE DECISIONS AND WE MAKE THEM  
EVERY WAKING HOUR. THEY RANGE THE SPECTRUM FROM THE TINIEST &  
INCONSEQUENTIAL TO THE MOMENTOUS & TITANIC, BUT MAKE THEM WE WILL.  
WE MAY DECIDE NOT TO DECIDE--BUT DECIDE WE WILL.

WE ALL FALL HEIR TO THE TINY DECISION (SHALL WE--LUNCH AT CLUB--  
PLAY BINGO TONIGHT) AND A FEW MAKE DECISIONS THAT ARE TRULY  
OVERAWING. WE, IN THE ACQUISITION BUSINESS, GET SOME THAT AFFECT  
NOT ONLY THE WELL-BEING OF OUR COUNTRY, NOT ONLY THE W. HEMISPHERE,  
& NOT ONLY THE WORLD, BUT SPACE & THE UNIVERSE. WE ARE TRULY ON  
THE LIP OF THE NUCLEAR & SPACE AGE & OUR DECISIONS ARE FORERUNNERS--  
BUILDING BLOCKS OF THE DECISION PROCESS--AFSARC & DSARC.

IN MAKING THESE CATAclysmic DECISIONS, THERE'S ONLY ONE WHOLELY  
WRONG DECISION & THAT'S TO "DECIDE NOT TO DECIDE." LET'S SEE HOW  
THE AIR FORCE PROCESS CONTRIBUTES & LOOK AT WHAT WE'RE GOING TO  
CONSIDER.

## AFSC OPENING REMARKS

### AF MANUFACTURING REVIEW PROGRAM

Since the larger costs of an acquisition program normally occur during the production phase, the AF has developed a series of fifteen formal reviews to reduce risks in the manufacturing area.

ESSENCE - A planned series of interrelated manufacturing reviews constitutes a manufacturing review program. These reviews provide opportunities to put emphasis on producibility early in the acquisition cycle, to integrate manufacturing considerations throughout the life of the program, and assess status of planning for the production phase.

### REVIEWS

Some of the reviews are performed by the government and some by contractors. Some of the reviews are used to evaluate contractors without regard to any specific program. Some are performed before a particular program contract is awarded and others are conducted during the performance of a given contract. All reviews, however, evaluate a contractor's current or potential capability and performance, identify manufacturing risks and assess ability to transition from one phase to the next succeeding one in the program's life cycle.

KEY REVIEWS The key reviews in a Manufacturing Review Program are the Manufacturing Management/Production Capability Review (MM/PCR) and the Production Readiness Review (PRR).

### MM/PCR

PURPOSE - MM/PCR is an evaluation (before the fact, that is, before award of contract) of competing manufacturer's planned manufacturing management system and production capability and capacity to meet known production requirements of proposed systems considering firm and projected business. Its primary purpose is to support the source selection process and is conducted by the SPO. A pre-award survey is requested by the SPO and conducted by the Plant Cognizant Activity.

WHEN - The MM/PCR is an investigation conducted by a Program Office manufacturing function during source selection process to ascertain how well prospective contractors can accomplish the manufacturing tasks of a proposed program throughout its entire life cycle. The MM/PCR can be performed during the demonstration and validation phase and the full scale engineering development phase for selection of validation contractors and selection of FSED contractors.

USED - Selection of Contractors - The MM/PCR is conducted at prospective contractors plants during the Source Selection Process. It is an ideal basis for comparison of contractors and it aids and influences the decision and selection process during validation and FSED phases. The MM/PCR data acquired at the winning contractor's facility is the departure point (reference) for the subsequent PRR program. This data should also be used by the Should Cost Team and should enable them to more quickly focus attention on high risk design areas. The data should also be used by the Source Selection Board (SSB) to assist them in their evaluation. The data from the MM/PCR, conducted on the selected contractor, provides a Traceability base line for the subsequent PRRs. This comparison of the baseline data to later reviews reveals trends and provides insight to the contractor's progress and capabilities.

#### PRR

PURPOSE - The PRR is a formal inspection conducted by the Program Office (after the fact) in support of MILESTONE III decision. It is to identify remaining manufacturing risks by determining whether or not:

- a. Systems are ready for efficient and economical production.
- b. The Production engineering problems have been resolved.
- c. The contractor has performed adequate planning for production.

WHEN - The PRRs are conducted by the program office and during the Full Scale Engineering Development (FSED) in support of MILESTONE III decisions.

## PRR PROGRAM

DEFINE - There seems to be an implicit idea that all facets of a PRR are covered in one evaluation. In the incremental, the full scope of the PRR is broken down and different element or segments are evaluated at different times during the FSED. So incremental PRRs are really elements or segments of a complete PRR. This is particularly true, because in the period immediately following the FSED, some of the production engineering efforts have just begun or are beginning. Consequently, all that can be examined is the treatment and efforts accorded to the plans and programs identified in the MM/PCR. There are, however, features of any major defense aerospace program that must be treated or attended to early i.e.; long term lead; critical materials, facilities and labor skills. Once these strategic items have been addressed in their strategic time frame, only periodic surveillance and traceability of their trends are required.

ADVANTAGES - Incremental PRRs provide the following advantages:

Many Locations - In large systems with many contractors and subcontractors incremental Reviews are more practical for reviewing all the plants involved. Incremental PRRs more readily adapt themselves to covering many facilities.

Time Constraints - Strategic elements for consideration must be considered at appropriate times during the FSED phase in order to be effective. This allows items requiring extended time to be considered early.

Team Size - The incremental PRR allows smaller team sizes since fewer segments are reviewed. In addition, the teams can analyze the elements to a greater depth. Smaller teams cause less contractor disruption.

Traceability and Reference - The PRR iterations provide a readily identifiable traceability of key production related items. Data from initial PRR iterations also provide an excellent reference on where to focus at subsequent Production Reviews and suggest other areas to investigate and provide a timely view of trends and the contractor's progress.

## PRR PLANS

PRR plans have been neglected and need emphasis. They should be tailored to the system--not generalities. They should contain as a minimum a description of the system and the principal contractors involved. It should address for the first iteration identification of critical materials and long lead times, advance funding, facilities and equipment and availability of labor skills.

## HQ LESSONS LEARNED

Unique Requirements - involves NATO involvement; Rationalization Standardization and Interoperability (RSI) FSED strategy should be identified which would lead to addressing concurrency, affordability and other strategic items at appropriate times. The following items highlight other principal lessons learned:

Manufacturing Involvement - IG cited - Basis for PRR Planning.

Procurement Plans - Program Management Plans - SOW preparation - Cost Proposal Analysis - Component Breakout - GFAE Management - Subcontractor Management.

Long Lead Items and Critical Materials should be identified and actions initiated for applicable priorities.

Manufacturing Technology contracts held by contractors should be identified and areas where they are implemented. These are candidates for review early and at successive iterations.

Labor Features - Skills availability and potential labor problems should be identified.

## EVALUATION

These are question areas that have arisen at HQ. We solicit your discussion and contributions. Some of these are:

EMPHASIS - is looked at

MM/PCR - Is there enough emphasis?

Source Selection - Is there adequate criteria? Is it enough?

Manufacturing Modernization & Productivity - Have we done enough there?

Especially in view of world market?

## USE

MM/PCR - Used effectively?

Key Reviews - Are they done in an integrated fashion or functionally?

PRR Improvement - How can we improve the PRR process?

## SUMMARY

Remember - AF manufacturing review program  
series of reviews

Remember - Key reviews  
MM/PCR (before fact)  
PRR (after the fact)

Remember - Decision process it is a management tool

## EPILOGUE

### SUMMARY

SO IN SUMMARY LET'S:

#### REMEMBER

THAT THE AIR FORCE MANUFACTURING REVIEW PROGRAM IS A SERIES OF REVIEWS RELATING TO MANUFACTURING.

#### REMEMBER

THAT THE KEY REVIEWS ARE:

- \* MM/PCR - MANUFACTURING MANAGEMENT PRODUCTION CAPABILITY REVIEW
  - LOOKS AT POTENTIAL BEFORE - FACT
- \* PRR - PRODUCTION READINESS REVIEW
  - LOOKS AT CURRENT PRODUCTION READINESS - AFTER FACT

#### REMEMBER

- \* THESE REVIEWS ARE BUILDING BLOCKS OF THE DECISION PROCESS & ARE BASIS FOR MEANINGFUL DECISION & ACQUISITION MANAGEMENT



# **AIR FORCE MANUFACTURING REVIEW PROGRAM**

PRESENTOR: D.T. MURPHY  
HQ AFSC/PMD  
19 NOV 80

## **CONTENTS**

- ESSENCE
- TYPE REVIEWS
- KEY REVIEWS
- PRR PROGRAM
- PRR PLANS
- HQ LESSONS LEARNED
- EVALUATION

## **ESSENCE**

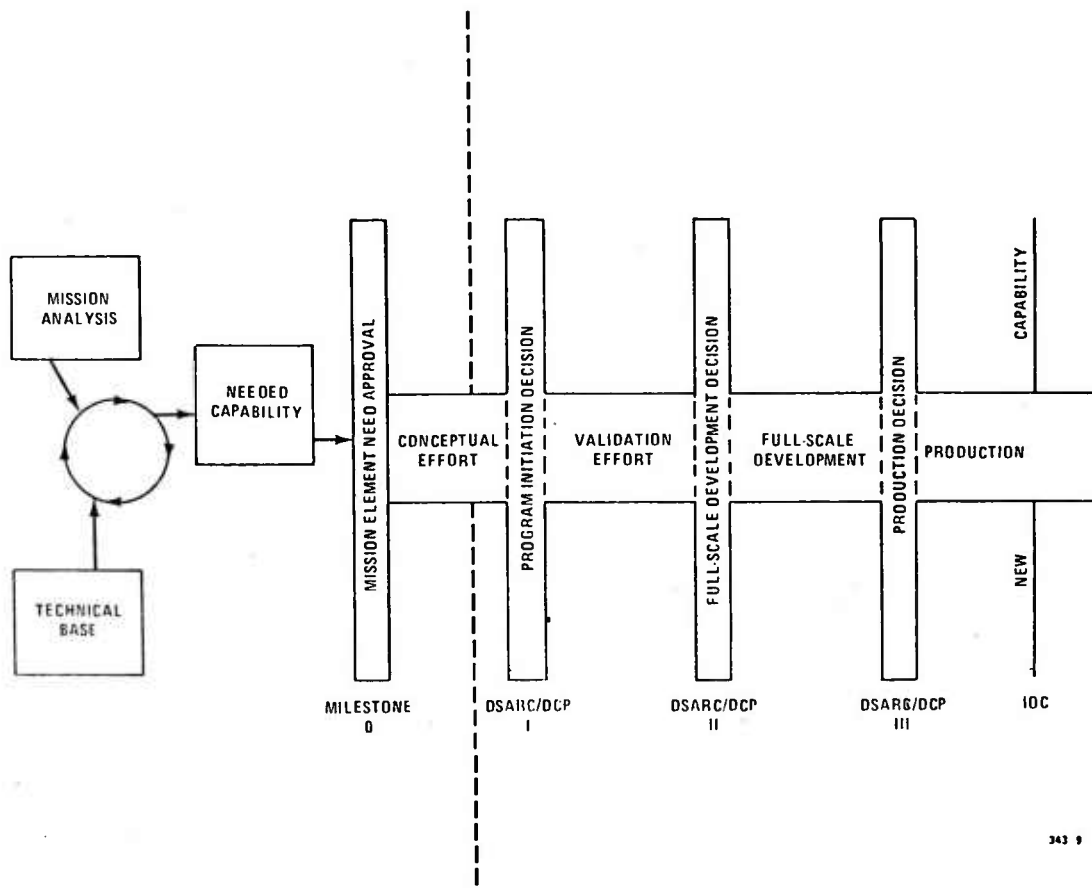
- SERIES MANUFACTURING REVIEWS
- EMPHASIS PROOUCIBILITY-EARLY
- INTEGRATES MANUFACTURING CONSIDERATIONS  
THRU PROGRAM LIFE
- ASSESSES PRODUCTION PLANNING

## **TYPES OF REVIEWS**

- GOVERNMENT PERFORMED
- CONTRACTOR PERFORMED
- EVALUATE
  - BEFORE SPECIFIC AWARD
  - OURING CONTRACT PERFORMANCE

# KEY REVIEWS

- MM/PCR
  - MANUFACTURING MANAGEMENT PRODUCTION CAPABILITY REVIEW
- PRR
  - PRODUCTION READINESS REVIEW



## **MM/PCR**

- PURPOSE (BEFORE FACT)
  - EVALUATION COMPETING CONTRACTORS
    - MANUFACTURING MANAGEMENT SYSTEM
    - PRODUCTION CAPABILITY - CAPACITY FIRM & PROJECTED
- WHEN
  - PHASES - DEMONSTRATION & VALIDATION/FSED
- USED:
  - PRE-AWARD SURVEY
  - SELECTION
  - REFERENCE - PRRs

## **PRR**

- PURPOSE (AFTER FACT)
  - FORMAL INSPECTION
  - IDENTIFIES RISKS
    - SYSTEM READY - OPTIMUM PRODUCTION
    - PRODUCTION ENGINEERING PROBLEMS SOLVED
    - CONTRACTOR PLANNING ADEQUATE
- WHEN
  - DURING FSED
  - SUPPORT MILESTONE III

## **PRR PROGRAM**

- **DEFINE**
  - **INCREMENTAL REVIEWS**
- **ADVANTAGES**
  - **MANY LOCATIONS**
  - **TIME CONSTRAINTS**
    - **STRATEGIC ITEM**
  - **SMALLER TEAMS**
  - **DEPTH OF ANALYSIS**
  - **TRACEABILITY - REFERENCE**

## **HQs LESSONS LEARNED**

- **UNIQUE REQUIREMENT**
  - **NATO**
  - **RSI**
  - **AFFORDABILITY**
- **CONCURRENCY**
- **MANTECH CONTRACTS**
- **LABOR FEATURES**
- **PRR PLANS**
  - **STRATEGIC ISSUES (TIME CONSTRAINTS)**

## **PRR PLANS**

- **NEGLECTED**
- **TAILORED TO SYSTEM**
  - **SYSTEM DESCRIPTION**
  - **CONTRACTORS**
- **TIME CONSTRAINTS - EARLY**
  - **LONG LEAD**
  - **FUNDING**
  - **FACILITIES**

## **SUMMARY**

- **AF REVIEW PROGRAM**
  - **SERIES**
- **FEATURES**
  - **BEFORE (MM/PCR)**
  - **AFTER (PRR)**

## **EVALUATION**

- EMPHASIS - ENOUGH?
  - MM/PCR
  - SOURCE SELECTION CRITERIA
  - MANUFACTURING MODERNIZATION & PRODUCTIVITY
- USES - EFFECTIVE
  - MM/PCR
  - INTEGRATED REVIEWS - FUNCTIONAL
- IMPROVE PRRs - HOW



## 1980 DOD PRODUCTION READINESS REVIEW CONFERENCE

### SCRIPT TO ACCOMPANY

#### "PRRs from the Electronic Systems Division Perspective"

Presented By

Richard A. L'Heureux

The information presented here describes what works for AF Electronic Systems Division (ESD) regarding PRRs. It is not intended to make a judgement of other approaches - it is what works for ESD - if the information can be of value to you the presentation will have been worthwhile.

Regarding review techniques, approach the PRR task as though you were to build the hardware - be a doer don't listen to extensive contractor brochuremanship. We have found that the evaluation of all aspects of a selected item of hardware is preferable to a broad brush view of all the system - a core sample tests the entirety of the production planning/design readiness of the hardware.

Go on record in the Statement of Work (SOW) of the contract stating that the government will not ask the contractor for any data other than that normally used in the conduct of the effort - but state further that the contractor will make that existing information available for government review and provide limited assistance to find and extract the data.

Limit the team size and duration of the review(s) - it's early to do it and not the easiest task but if we don't want to have huge bills for PRRs we have to do it. Use outside help in specialized areas and try not to have so much program office participation that it overpowers the team at the expense of the objectivity of the review.

All of the foregoing rolls up into a recommended SOW as shown here.

The PRR has a clear purpose and it should not be considered a substitute for or an adjunct to any of the other reviews/surveys we accomplish - to do that would dilute the value of both. The PRR, however, does gather data from all the sources shown here to highlight fruitful areas for review.

As mentioned before, we prefer to take a core sample of hardware and analyze all the aspects of it to the broad brush treatment. Where foreign subcontractors are used, we should concentrate on insuring that there has been an adequate transfer of total information necessary to produce and to insure that it can be assimilated into the subcontractor's system.

To give an example of what we feel is the necessary flexibility of the PRR here is a special emphasis subject - productivity.

What results do we expect from a PRR? We'd much rather see two or three well defined and supported conclusions with recommendations for reducing the risk than a sea of general observations resulting in a noncommittal report. Be brief in the reports - keep plenty of backup data - but have a heart on the reader!

Implementation - get the support of the affected program management - tell them good things as well as bad, and by all means establish a followup plan - with assigned OPRs --- then follow it up on a regular schedule.

Summary - have the foresight to plan the PRR months (even years) before it is to be done - in the contract. Do the review - don't go and listen to contractor presentations. Support your conclusions - establish a remedial plan where necessary - and followup on the action items!

# **PRODUCTION READINESS REVIEWS FROM THE ELECTRONIC SYSTEMS DIVISION PERSPECTIVE**

## **O V E R V I E W**

OBJECTIVES  
REVIEW TECHNIQUES  
DATA REQUIREMENTS  
TEAM SIZE AND COMPOSITION  
SAMPLE STATEMENT OF WORK ENTRY  
RELATIONSHIP TO OTHER REVIEWS  
READINESS REVIEW TASKING  
SPECIAL SUBJECT-PRODUCTIVITY  
EXPECTED RESULTS OF PRRs  
IMPLEMENTATION OF FINDINGS  
SUMMARY

## OBJECTIVES

ASSESS STABILITY OF DESIGN

DETERMINE ADEQUACY OF PRODUCTION PLANNING

## REVIEWS TECHNIQUES

MANUFACTURING DIRECTORATE RESPONSIBILITY

MODUS OPERANDI - BE A DOER; NOT A LISTENER TO CONTRACTOR PRESENTATIONS

LENGTH - TRY TO LIMIT TO 5 DAYS MAXIMUM (THIS SHOULD BE IN SCW)

CORE SAMPLE VS BROAD BRUSH

AREAS TO BE REVIEWED COORDINATED WITH PROGRAM OFFICE

INSURE CAO INVOLVEMENT

ORGANIZE - SCHEDULE - COORDINATE

## DATA REQUIREMENTS

DO NOT REQUIRE DATA OTHER THAN THAT GENERATED IN THE  
COURSE OF THE PROGRAM - PUT THIS IN WRITING (SOW)

DO REQUIRE ACCESS TO CONTRACTOR DATA IN SUPPORT OF  
PRR (SOW)

DO STATE LIMITED CONTRACTOR ASSISTANCE WILL BE  
NECESSARY IN LOCATING/EXTRACTING DATA

## TEAM SIZE AND COMPOSITION

PESO INVOLVEMENT AT ESD

LIMIT TEAM SIZE AND MAKE THAT A MATTER OF  
EARLY RECORD (THREE TO EIGHT)

ADDRESS MOST SIGNIFICANT AREAS IDENTIFIED  
BY MANUFACTURING AND COORDINATED WITH  
PROGRAM OFFICE

CALL ON OUTSIDE SUPPORT (LABORATORIES/PESO/  
NON-PROGRAM DESIGN ENGINEERS, QUALITY  
ASSURANCE EXPERTS/ETC)

PROGRAM OFFICE REPRESENTATION

## SAMPLE STATEMENT OF WORK ENTRY

"THE CONTRACTOR SHALL SUPPORT THE CONDUCT OF INCREMENTAL PRODUCTION READINESS REVIEWS (PRRs) DURING THE FSED PROGRAM.

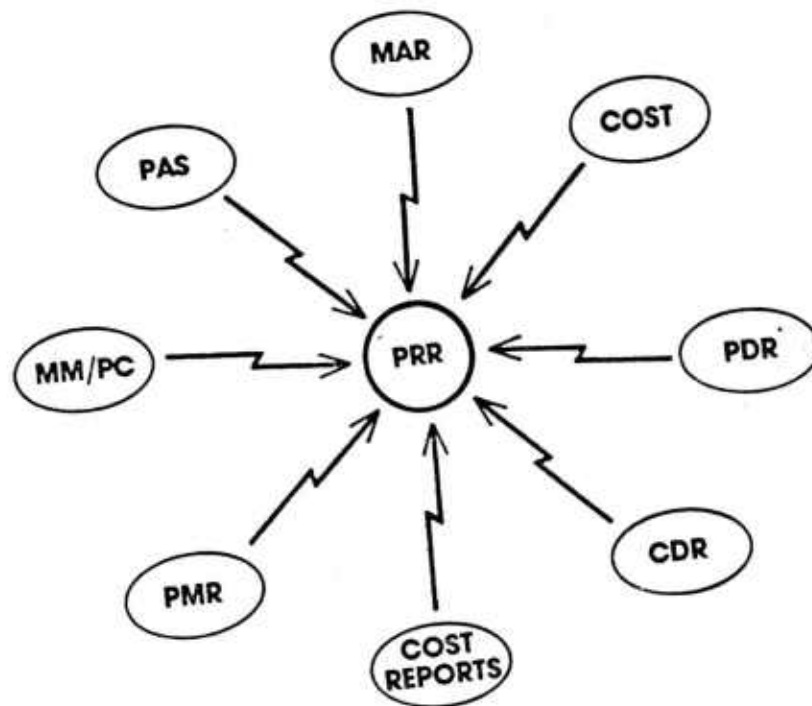
"CONTRACTOR SUPPORT REQUIREMENTS WILL BE LIMITED TO THAT NECESSARY TO IDENTIFY SOURCES OF INFORMATION/DATA TO PRR TEAM MEMBERS AND TO LIMITED PERSONAL INTERVIEWS DURING THE REVIEW FOR CLARIFICATION OF DATA ASSESSED BY TEAM MEMBERS. THERE WILL BE NOT MORE THAN THREE REVIEWS CONDUCTED, TWO OF WHICH WILL HAVE NOT MORE THAN FIVE GOVERNMENT REPRESENTATIVES AND WILL NOT EXCEED FIVE DAYS IN THE CONTRACTOR'S FACILITY. THE THIRD AND FINAL REVIEW TO BE CONDUCTED NEAR THE END OF FSED PHASE WILL BE ACCOMPLISHED BY NOT MORE THAN SEVEN GOVERNMENT REPRESENTATIVES AND WILL LAST NOT MORE THAN FIVE WORKDAYS IN THE CONTRACTOR'S FACILITY. THE CONTRACTOR WILL NOT BE TASKED TO PREPARE ANY DATA TO SUPPORT THE PRRs WITH THE EXCEPTION OF SLIDES OR OTHER INFORMATION DESIRED BY THE CONTRACTOR TO EXPEDITE THE REVIEW.

## RELATIONSHIP TO OTHER REVIEWS

A PRR USES INFORMATION FROM ALL OTHER PROGRAM/  
FUNCTIONAL REVIEWS/SOURCES

A PRR IS NOT

- AN MM/PC
- A MFG ASSESSMENT REVIEW
- A COST REVIEW
- A PDR OR CDR
- A PMR
- A PREAWARD SURVEY



#### READINESS REVIEW TASKING

ESD APPROACH LEANING TOWARD INTENSIVE LOOK AT A SMALL SELECTED AREA, E.G. ONE SUBSYSTEM TRACED TO COMPONENT PARTS, SCHEDULES, WORK INSTRUCTIONS

WHERE MAJOR SUBCONTRACTORS ARE INVOLVED, EITHER DO A SEPARATE PRR (WITH KNOWLEDGE AND CONSENT OF PRIME) OR CLOSELY MONITOR PRIME'S REVIEW (IDENTIFY IN SOW)

FOREIGN SUBCONTRACTORS - EMPHASIS ON INFORMATION TRANSFER

REVIEW AREA ASSIGNMENT - TRY TO LIMIT TO ONE PER MEMBER - CAO ASSIGNED WHERE SYSTEM FAMILIARITY MOST IMPORTANT (QA, PLANT LAYOUT, ETC)

## SPECIAL SUBJECT - PRODUCTIVITY

IF REQUIRED IN CONTRACT, THE FOLLOWING PRODUCTIVITY ASSURANCE ELEMENTS SHOULD BE ASSESSED IN PRR:

- HAS THE CONTRACTOR IMPLEMENTED PRODUCTIVITY ASSURANCE PROGRAM WHICH FULLY ADDRESSED THE PROGRAM'S NEEDS?
- HAS THE RESULTS OF THE PRODUCTIVITY ASSURANCE PROGRAM BEEN AGGRESSIVELY PURSUED IN FULFILLMENT OF PROGRAM NEEDS?
- WILL PRODUCTIVITY ASSURANCE IMPROVEMENTS BE OPERABLE IN SUFFICIENT TIME TO IMPACT THE SUBJECT PROGRAM?

## EXPECTED RESULTS OF PRRs

DEFINITIVE, SUPPORTABLE CONCLUSIONS IN SELECTED REVIEW AREAS RELATIVE TO READINESS FOR PRODUCTION PHASE

IDENTIFICATION OF AREAS REQUIRING ADDED PROGRAM/  
MANUFACTURING MANAGEMENT EMPHASIS IN PRODUCTION

BRIEF REPORTS CONSISTENT WITH ENOUGH RATIONALE TO  
SUPPORT REVIEW FINDINGS - BRIEF

## IMPLEMENTATION OF FINDINGS

EXECUTIVE LEVEL BRIEFING TO PROGRAM DIRECTOR  
AND STAFF

PRESENT POSITIVE AS WELL AS NEGATIVE REVIEW  
FINDINGS

RECOMMEND FOLLOW-UP ACTIONS/SUGGEST ACTION AGENCIES  
(PROGRAM OFFICE/CAO/CONTRACTOR)

ESTABLISH FOLLOW-UP REVIEW CYCLE (WITH REPORTING  
AS APPROPRIATE) TO INSURE THAT FINDINGS ARE ADDRESSED

## S U M M A R Y

- PLANNING - PUT RIGHT REQUIREMENTS IN THE CONTRACT/  
BE REALISTIC/BE COST EFFECTIVE/USE PESO  
IN ADVISORY/APPROVAL ROLE
- EXECUTION - BE A DOER NOT A LISTENER/CALL ON WHATEVER  
EXPERTISE NECESSARY/STAY ON TRACK
- RESULTS - SUPPORTABLE CONCLUSIONS/MAKE IMPACT FELT/  
FOLLOW-UP



SLIDE 1 - COMMAND LOGO. I AM MAJOR STAN ZALACE OF THE ARMAMENT DIVISION'S DIRECTORATE OF MANUFACTURING.

SLIDE 2 - MISSION AND PROGRAMS. THIS NEXT SLIDE SHOWS OUR PRIMARY MISSION AND LISTS SOME OF THE PROGRAMS WE ARE WORKING ON. OUR MISSION ENCOMPASSES THE ENTIRE SPECTRUM OF ACTIVITIES FROM RESEARCH, TECHNOLOGY AND DEVELOPMENT PLANNING TO INITIAL ACQUISITION OF ARMAMENT FOR THE AIR FORCE INVENTORY. OUR PROGRAMS RANGE IN SIZE AND COMPLEXITY FROM 20MM AMMUNITION AT ONE END OF THE SPECTRUM TO CONVERSION OF THE F-100 SUPER SABRE INTO A REMOTELY PILOTED FULL SCALE AERIAL TARGET AT THE OTHER END.

SLIDE 3 - AD ORGANIZATION. THIS SLIDE SHOWS MY ORGANIZATION WITHIN THE DEPUTATE FOR CONTRACTING AND MANUFACTURING AND ALSO THE PROGRAM OFFICE STRUCTURE UNDER THE DEPUTY FOR ARMAMENT SYSTEMS. MANUFACTURING IS A MATRIXED ORGANIZATION; THAT IS, THE MAJORITY OF OUR PERSONNEL ARE COLOCATED IN THE VARIOUS PROGRAM OFFICES. WHILE MOST OF THE MEMBERS OF A PRODUCTION READINESS REVIEW TEAM COME FROM THE PROGRAM OFFICE, THE TEAM DIRECTOR IS ONE OF THE DIVISION CHIEFS FROM THE DIRECTORATE OF MANUFACTURING. WE SHALL SEE LATER THAT THIS IS VERY SIGNIFICANT.

SLIDE 4/5 - HEAD SCRATCHER/TITLE SLIDE. NOW THAT WE HAVE SEEN THE OUTLINE OF THE ORGANIZATIONS PRIMARILY INVOLVED IN PRRS, WE CAN LAUNCH INTO THE MEAT OF MY FIRST BRIEFING.

IN THE PAST THREE YEARS, THE DIRECTORATE HAS PERFORMED TWELVE PRRS. THESE RANGED FROM ONE ON AN ELECTRONIC BOMB FUZE TO ONES ON A SUPERSONIC BOMB RACK AND AN AIR INFLATABLE BOMB RETARDER.

WE HAVE TWO MORE IN PLANNING AT THIS TIME, TO BE PERFORMED BY MARCH 1961. MY PURPOSE HERE TODAY IS TO SHOW YOU HOW WE CONDUCT THESE REVIEWS.

SLIDE 6 - OVERVIEW. IN ADDITION TO THESE POINTS, PLEASE FEEL FREE TO ASK QUESTIONS AT THE END OF MY PRESENTATION.

SLIDE 7 - REGULATORY GUIDANCE.

- MOVING INTO THE REASONS FOR THE PRR, WE FIND THAT AD WORKS WITHIN THE CONSTRAINTS OF THESE DIRECTIVES. ADDRESSING THE LOWER TWO BULLETS:

- AFSCR 84-2 STATES "THE PRR IS A FORMAL INSPECTION..." IT ALSO SAYS THAT "THE PRR APPLIES TO COMPETITIVE PROCUREMENTS."

- AD SUP 1 TO AFSCR 84-2 ADDS "FOR THOSE PROGRAMS IN WHICH THE FULL SCALE DEVELOPMENT CONTRACTOR IS ANTICIPATED TO PERFORM THE INITIAL PRODUCTION (THAT IS, SOLE SOURCE PROCUREMENT), A FULL PRR WILL BE CONDUCTED AT THE COMPLETION OF THE FULL SCALE DEVELOPMENT PHASE."

SLIDE 8 - OBJECTIVE.

- THE PRR IS A FORMAL INSPECTION TO DETERMINE THREE THINGS:

- IF A SYSTEM OR EQUIPMENT DESIGN UNDER DEVELOPMENT IS READY FOR EFFICIENT AND ECONOMICAL QUANTITY PRODUCTION

- THAT ALL IMPORTANT PRODUCTION ENGINEERING PROBLEMS ENCOUNTERED DURING DEVELOPMENT HAVE BEEN RESOLVED.

● THAT THE CONTRACTOR HAS ACCOMPLISHED ADEQUATE PLANNING FOR THE PRODUCTION PHASE.

SLIDE 9 - IMPORTANCE.

● ADDRESSING THE SECOND BULLET ON THIS SLIDE, THE QUESTION BEING ASKED IS: FROM A PRODUCIBILITY STANDPOINT, IS THIS DESIGN READY FOR PRODUCTION?

● THE THIRD BULLET IS ASKING: FROM A PRODUCTION STANDPOINT, IS THIS COMPANY READY FOR PRODUCTION?

SLIDE 10, 11 - OUTFITTING A TEAM AND THE PRR PLAN

- PRIOR TO LEAVING FOR A CONTRACTOR'S FACILITY TO PERFORM A PRR, THE DIRECTORATE OF MANUFACTURING WILL HAVE BUILT A FORMAL, DETAILED, PLAN FOR CONDUCTING THE INSPECTION. THIS PLAN WILL COVER EVERY ASPECT OF THE PRR, INCLUDING THE ACTUAL QUESTIONS WHICH WILL BE ASKED. IN OTHER WORDS, IT IS CAREFULLY TAILORED FOR THE OCCASION.

-- A SHORT PROGRAM BACKGROUND IS INCLUDED IN THE PLAN TO ACQUAINT ALL TEAM MEMBERS WITH THE PROGRAM'S HISTORY AND CURRENT STATUS. THIS IS IMPORTANT AS THE TEAM IS COMMONLY AUGMENTED BY PEOPLE FROM OUTSIDE THE ARMAMENT DIVISION.

-- THE PLAN LISTS THE TEAM MEMBERS AND DEFINES THE RESPONSIBILITIES OF EACH, ESPECIALLY PANEL CHAIRMEN.

(SLIDE 12 - PRR TEAM INSTRUCTIONS)

-- THE PLAN GIVES A DETAILED SET OF INSTRUCTIONS FOR THE USE OF EACH TEAM MEMBER. THESE INCLUDE:

(SLIDE 13 - QUESTION SHEET)

- ANSWERING AS MANY PRR QUESTIONS AS POSSIBLE AND DRAFTING AREA OF CONCERN SHEETS PRIOR TO GOING TO THE CONTRACTORS FACILITY.

(SLIDE 14 - AOC SHEET) (THOSE QUESTIONS WHICH GENERATE A CONCERN OR REQUIREMENT FOR ACTION BY THE CONTRACTOR, GOVERNMENT, OR BOTH, WILL GO ON AOC SHEETS)

- DEVELOPING A STATEMENT OF THE TASKS EACH TEAM MEMBER EXPECTS TO ACCOMPLISH IN SUPPORTING THE PRR.
- AT THE END OF THE PRR, DEVELOPING A NARRATIVE SUMMARY FORMALIZING THE INDIVIDUAL'S OBSERVATIONS ABOUT THE CONTRACTOR'S PERFORMANCE. THIS SUMMARY MUST INCLUDE AN ASSESSMENT OF RISK. THE SUMMARIES ARE GIVEN TO THE PANEL CHAIRMAN.
- IN ADDITION TO THESE THREE ITEMS JUST COVERED, PANEL CHAIRMEN MUST, WITH HELP FROM PANEL MEMBERS, DEVELOP THE CRITERIA WHICH THE CONTRACTOR MUST MEET TO ACHIEVE A SUCCESSFUL PRR, AND DEVELOP THE LIST OF QUESTIONS USED TO DETERMINE WHETHER OR NOT THE CRITERIA HAVE BEEN MET.
- THE PANEL CHAIRMAN WILL SUMMARIZE THE FINDINGS OF PANEL MEMBERS AND ASSIST THE TEAM DIRECTOR IN WRITING THE FINAL PRR REPORT.

-- THE PLAN ALSO PROVIDES A DETAILED AGENDA OF ALL EVENTS WHICH WILL TAKE PLACE AT THE CONTRACTOR'S FACILITY.

(SLIDE 15 - POST PRR TASKS)

-- POST PRR TASKS INCLUDE:

- ASSESS PRODUCTION RISKS AND DEVELOP ALTERNATIVES TO REDUCE OR ELIMINATE RISKS.

- INITIATE ANY FORMAL ACTION TO BE ACCOMPLISHED BY THE COMPANY.
- FOLLOW-UP TO INSURE ALL CORRECTIVE ACTIONS ARE COMPLETED.
- PREPARE FINDINGS FOR PRESENTATION TO THE AD ACQUISITION REVIEW COUNCIL.

- THE PRR PLAN GOES THROUGH A FORMAL APPROVAL CYCLE. THE PLAN IS BUILT WITHIN THE DIRECTORATE OF MANUFACTURING AND SIGNED BY THE TEAM DIRECTOR WHEN COMPLETED. THE PROGRAM MANAGER THEN COUNTERSIGNS THE PLAN TO INDICATE THAT THE PROGRAM OFFICE CONCURS WITH IT. THE DIRECTOR OF MANUFACTURING THEN REVIEWS THE FINALIZED PLAN AND APPROVES IT.

- TO STREAMLINE THE MECHANICS OF MAKING UP THE QUESTIONS WHICH WILL BE ASKED, WE HAVE BUILT A CATALOGUE OF QUESTIONS ON THE VARIOUS AREAS TO BE REVIEWED. THIS CATALOGUE IS BEING AUTOMATED SO THAT IT CAN BE QUICKLY UPDATED, AND QUESTIONS SELECTED FROM IT AND PRINTED OUT AS IS OR MODIFIED.

SLIDE 16 - OUR TEAM

SLIDE 17 - THE PRR TEAM

- THIS SLIDE SHOWS THE STANDARD AD PRR TEAM CONFIGURATION. THE USUAL TEAM SIZE IS 8-10 PEOPLE, AND HAS EXPANDED TO 14 WITH AUGMENTEES. (THE PANELS USUALLY AUGMENTED ARE PROGRAM MANAGEMENT, QUALITY ASSURANCE, AND MANUFACTURING). WE HAVE ALSO PERFORMED A PRR WITH ONLY 2 PEOPLE. OUR TEAM APPROACH ALLOWS FOR A THOROUGH EVALUATION OF THE CONTRACTOR'S CAPABILITY AND READINESS TO ENTER PRODUCTION. THE DIRECTORATE

OF MANUFACTURING IS A MATRIXED ORGANIZATION. BECAUSE OF THIS, WE HAVE CALLED UPON OUR PEOPLE TO SUPPORT PRRS BEING CONDUCTED FOR OTHER PROGRAM OFFICES THAN THE ONE TO WHICH THEY ARE ASSIGNED. THE BENEFITS FROM THIS PRACTICE ARE THAT PRODUCTION PROBLEMS ARE SEEN FROM A NEW VIEWPOINT, WE HAVE HAD A CROSSFEED OF IDEAS BETWEEN OUR VARIOUS BRANCHES, AND WE HAVE BEEN ABLE TO ESTABLISH A DEGREE OF PRR EXPERTISE IN ALL OF OUR PEOPLE.

- THE TEAM COORDINATOR FUNCTIONS AS THE MANUFACTURING PANEL CHAIRMAN AND IS PREPARED TO STAND IN FOR THE TEAM DIRECTOR.
- ALL OF THE PANELS MAY BE AUGMENTED BY AFPRO, NAVY, ARMY, OR DLA PERSONNEL, AS THESE AGENCIES DESIRE. IN ADDITION, WE MAY AUGMENT THE MANUFACTURING PANEL WITH A MANUFACTURING OPERATIONS CONSULTANT.

SLIDE 18 - MR. JACK R. FRANKS IS AD'S MANUFACTURING OPERATIONS CONSULTANT. HE ALSO WORKS IN THE SAME CAPACITY FOR THE F-16 PROGRAM OFFICE.

- HE SERVED AS THE DIRECTOR OF MANUFACTURING OPERATIONS FOR THE MCDONNELL-DOUGLAS ASTRONAUTICS CORPORATION UNTIL HIS RETIREMENT.

- HE IS A NATIONALLY KNOWN EXPERT.

- HE HAS WORKED ON PROGRAMS SUCH AS THE AIM-9 MISSILE, FMU-112 FUZE, BSU-49/B AIR INFLATABLE RETARDER, AND AMRAAM MISSILE FOR US.

SLIDE 19 - CONDUCT OF THE PRR

- WHEN THE TARGET DATE FOR THE PRR IS SET, ALL AFFECTED GOVERNMENT AGENCIES ARE NOTIFIED AND AN OUTLINE OF WHAT IS INTENDED PRESENTED TO THEM.

(SLIDE 20 - SUPPORTING CAST SLIDE)

THEY ARE INVITED TO AUGMENT THE TEAM WITH THEIR OWN PERSONNEL.

IN SOME INSTANCES WE MAY REQUEST THAT THEY AUGMENT THE TEAM.

- AT THIS SAME TIME, THE CONTRACTOR IS NOTIFIED OF THE INSPECTION AND REPRESENTATIVE FACTORS TO BE ADDRESSED BY EACH PANEL. HE

IS NOT GIVEN THE CRITERIA OR QUESTIONS. HE IS ALSO PROVIDED A

LIST OF ALL AD PERSONNEL WHO WILL BE VISITING HIS FACILITY.

- TWO INITIAL BRIEFINGS ARE GIVEN:

● THE FIRST IS A PRIVATE BRIEFING FOR ALL TEAM MEMBERS

IMMEDIATELY PRIOR TO MEETING THE CONTRACTOR. THIS BRIEFING COVERS SUCH THINGS AS THE AD STRAIGHT ARROW PROGRAM (AFR 30-30),

GOVERNING PERSONAL CONDUCT WHILE AT THE CONTRACTOR'S FACILITY;

INTRODUCTION OF ALL PERSONNEL FROM OTHER AGENCIES; FINAL INSTRUCTIONS; AND ANSWERING ANY QUESTIONS.

● THE SECOND BRIEFING IS TO THE CONTRACTOR. IT INTRODUCES THE GOVERNMENT TEAM, EXPLAINS WHAT A PRR IS, AND ETC.

- ALL TEAM MEMBERS MEET FOR A DAILY REVIEW AFTER FINISHING WITH THE CONTRACTOR FOR THE DAY. THIS MEETING UPDATES STATUS, HIGHLIGHTS AREAS OF CONCERN, AND PREPARES FOR THE NEXT DAY.

- WE TRY TO ALWAYS HAVE THE PCO AS A MEMBER OF THE PRR TEAM.

THE PCO SERVES AS THE PROCUREMENT/SUBCONTRACTING PANEL CHAIRMAN.

IT IS STRESSED TO BOTH THE CONTRACTOR AND TEAM THAT THE PRR TEAM MEMBERS SHALL IN NO WAY GIVE DIRECTION TO THE CONTRACTOR.

THE PCO IS THE ONLY PERSON AUTHORIZED TO ISSUE DIRECTION. HE

IS A TEAM MEMBER TO SEE FIRSTHAND THE CONTRACTOR'S STATUS,

AND HEAR DIRECTLY ANY QUESTIONS OR PROBLEMS.

- THE FINAL BRIEFING TO THE CONTRACTOR TELLS HIM WHETHER OR NOT HE HAD A SUCCESSFUL PRR, AND ANSWERS HIS QUESTIONS.

#### SLIDE 21 - REPORT AND BRIEFINGS

- THE FINAL REPORT SUMMARIZES THE ENTIRE PRR, AND IDENTIFIES AREAS WHICH WILL REQUIRE FOLLOW-UP. IT IS CONSTRUCTED IN SUCH A WAY AS TO PROVIDE TRACEABILITY FROM TOP LEVEL FINDINGS DOWN TO THE SPECIFIC FINDINGS NOTED BY INDIVIDUAL TEAM MEMBERS.

#### (SLIDE 22 - AD ORGANIZATION)

- THE DEPUTIES AND THEIR STAFFS ARE BRIEFED IN DETAIL.
- ANY FOLLOW-UP VISIT GENERATES A SEPARATE REPORT AND BRIEFINGS.
- THE FINAL REPORT PLUS ANY FOLLOW-UPS IS BRIEFED TO THE AD/ARC TO ASSIST THEM IN MAKING THEIR PRODUCTION RECOMMENDATION.

#### SLIDE 23 - INDEPENDENT BRIEFINGS

- A LESSON WE HAVE LEARNED IS THAT THIS BRIEFING APPROACH IS CRITICALLY IMPORTANT. IF THE PRR FINDINGS WERE ONLY BRIEFED TO THE PROGRAM OFFICE THERE IS A GOOD CHANCE THAT BECAUSE OF THE MOMENTUM OF THE PROGRAM AND PRESSURES ON THE PROGRAM MANAGER TO PRESS ON, THE FINDINGS WOULD BE BURIED AND FORGOTTEN. THE SEPARATE BRIEFINGS TO THE DEPUTY FOR CONTRACTING AND MANUFACTURING AND TO THE AD EXECUTIVE COUNCIL PREVENT THIS. CONDUCTING THE PRR INDEPENDENTLY OF PROGRAM OFFICE CONTROL AND BRIEFING THE FINDINGS AS WE DO MAKES THIS INSPECTION A VERY VALUABLE TOOL FOR DECISION MAKING.

#### SLIDE 24 - PRR FLOW DIAGRAM

THIS FINAL SLIDE IS A FLOW DIAGRAM OF HOW WE CONDUCT PRRS AT AD. PLEASE USE IT AS A REFERENCE IN FORMULATING ANY QUESTIONS YOU MAY HAVE FOR ME.

# HOW PRODUCTION READINESS REVIEWS ARE CONDUCTED BY THE ARMAMENT DIVISION

MAJOR STANLEY ZALACE  
DIRECTORATE OF MANUFACTURING  
DEPUTATE FOR CONTRACTING & MANUFACTURING  
ARMAMENT DIVISION

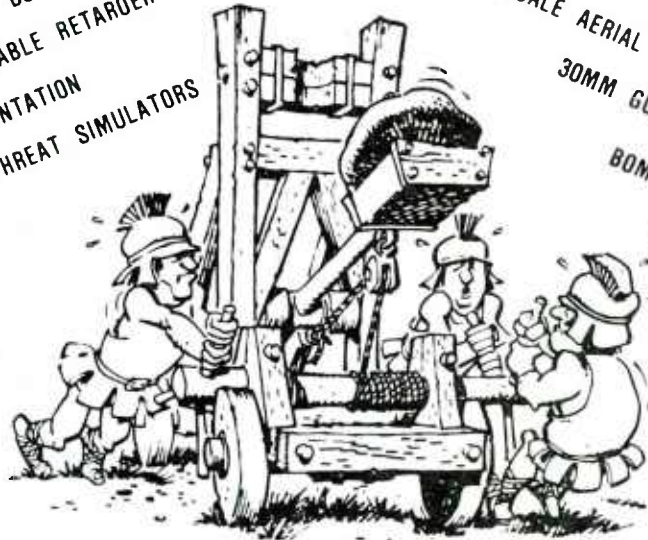


MAJOR STANLEY ZALACE  
DIRECTORATE OF MANUFACTURING  
DEPUTATE FOR CONTRACTING & MANUFACTURING  
ARMAMENT DIVISION

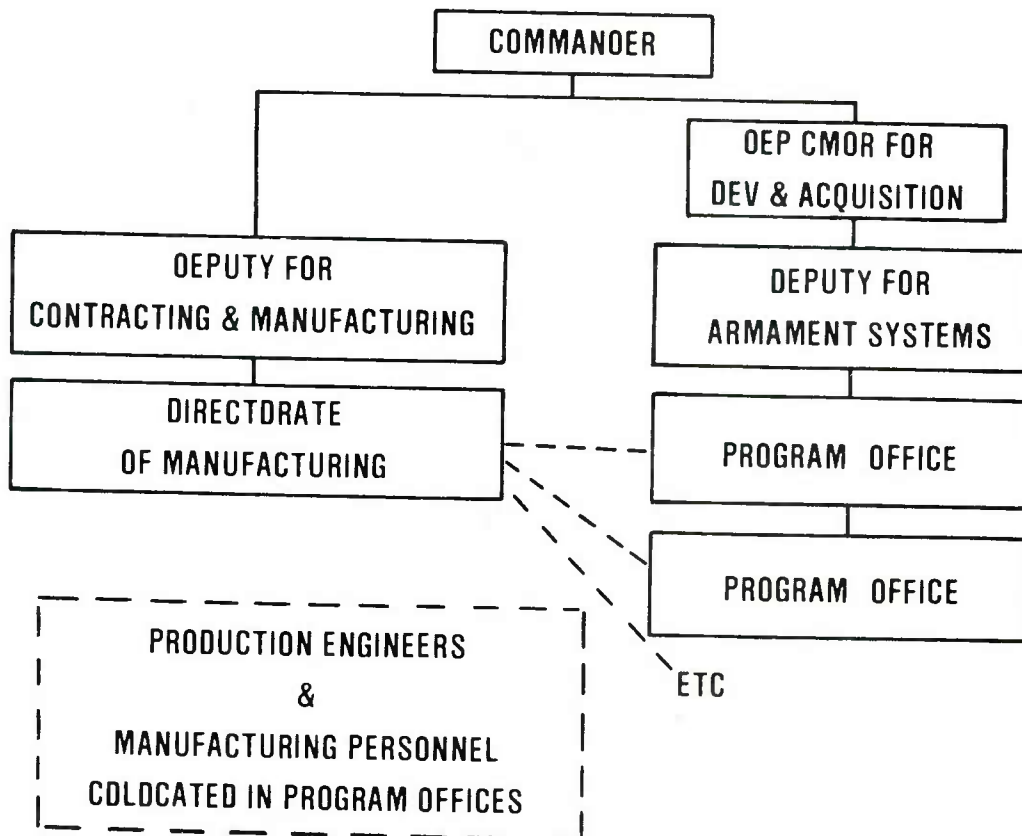
THE ARMAMENT DIVISION'S PRIMARY MISSION IS TO DEVELOP, TEST, AND INITIALLY ACQUIRE ALL NONNUCLEAR AIR ARMAMENT FOR THE AIR FORCE'S TACTICAL AND STRATEGIC FORCES.

LOW LEVEL LASER GUIDED BOMB  
 MULTIPLE STORES EJECTOR RACK  
 MODULAR GUIDED BOMBS  
 AIR INFLATABLE RETARDER  
 RANGE INSTRUMENTATION  
 ELECTRONIC THREAT SIMULATORS

ADVANCED MEDIUM RANGE AIR-TO-AIR MISSILE  
 WIDE AREA ANTI-ARMOR MUNITIONS  
 AERIAL STORES LIFT TRUCK  
 FULL SCALE AERIAL TARGETS  
 30MM GUN POD  
 BOMB FUZES  
 AIM-9  
 FLARES



## ARMAMENT DIVISION ORGANIZATION





"IT LOOKED GOOD ON THE DRAWING BOARD...."

## OVERVIEW

- REASONS FOR THE PRR
- THE PRR PLAN
- THE PRR TEAM
- CONDUCT OF THE PRR
- REPORT AND BRIEFINGS

## **REGULATORY GUIDANCE**

- DOD DIRECTIVE 5000.38 (24 JAN 79) PRR
- AFR 80D-9 (3 JUL 78) PRODUCTION MANAGEMENT  
IN THE ACQUISITION CYCLE
- AFSCR 84-2 (23 NOV 71) PRR
- AD SUPPLEMENT TO AFSCR 84-2 (2 JUN 77)

## **PRODUCTION READINESS REVIEW OBJECTIVE**

- READY FOR PRODUCTION
- PRODUCTION ENGINEERING PROBLEMS RESOLVED
- ADEQUATE PLANNING ACCOMPLISHED

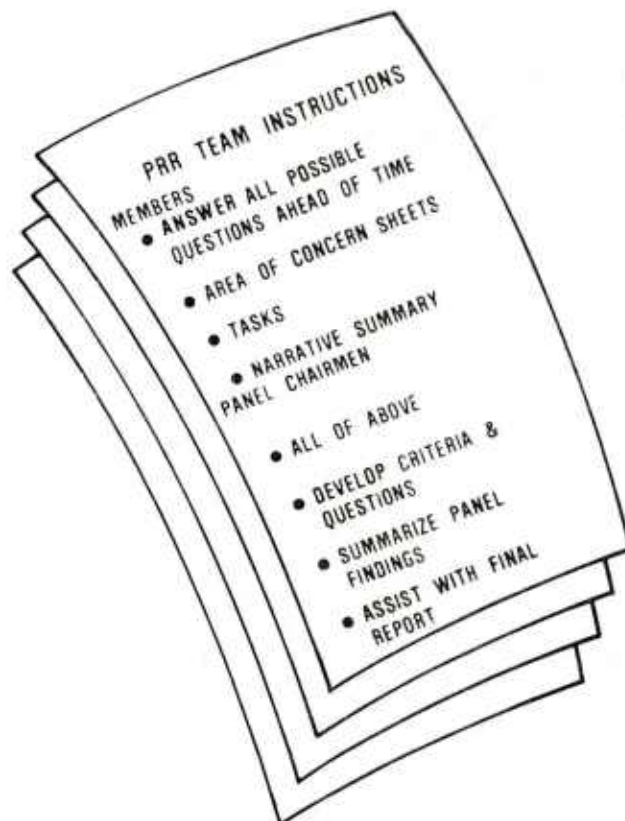
## **PRODUCTION READINESS REVIEW IMPORTANCE**

- MAJOR PROGRAM MILESTONE
- RISK ASSESSMENT OF CONTRACTOR'S ABILITY
- PREREQUISITE FOR PRODUCTION DECISION

## **THE PRR PLAN**

- A FORMAL DOCUMENT GIVING
  - PROGRAM BACKGROUND
  - TEAM COMPOSITION AND RESPONSIBILITIES
  - INSTRUCTIONS TO TEAM MEMBERS
  - AGENDA OF PRR
  - POST PRR TASKS
- PRR PLAN APPROVAL CYCLE
- AUTOMATED DATA BANK

WE CAN OUTFIT A TEAM FOR ANY SITUATION



DATE INTERVIEWED BY

TEAM

PERSON INTERVIEWED

☐ SATISFACTORY

☐ UNSATISFACTORY

QUESTION

FINDINGS

CONCLUSIONS/RECOMMENDATIONS

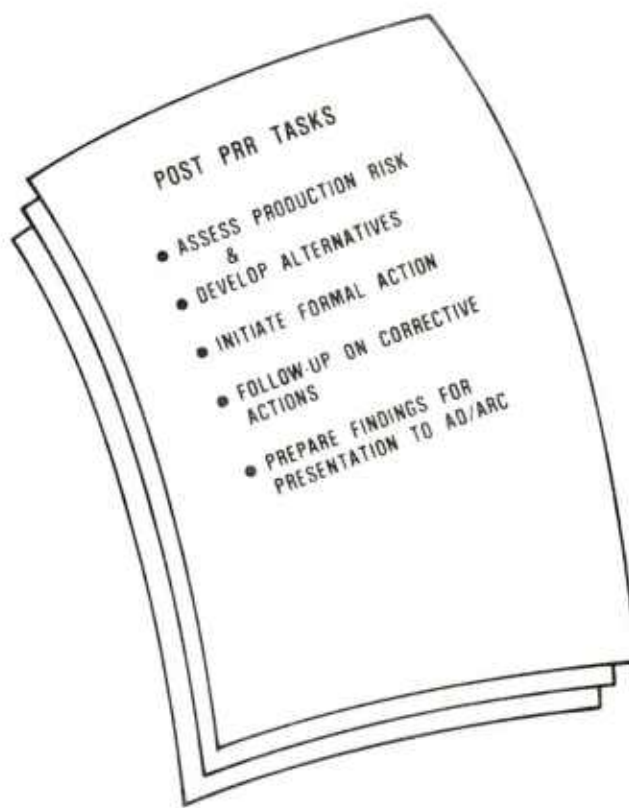
(INCLUDE RISK ASSESSMENT (HIGH, MODERATE, LOW)

AND WHY AND WHAT MAY BE DONE ABOUT IT)

AREA OF CONCERN (AOC)  
PROGRAM  
TEAM MEMBER

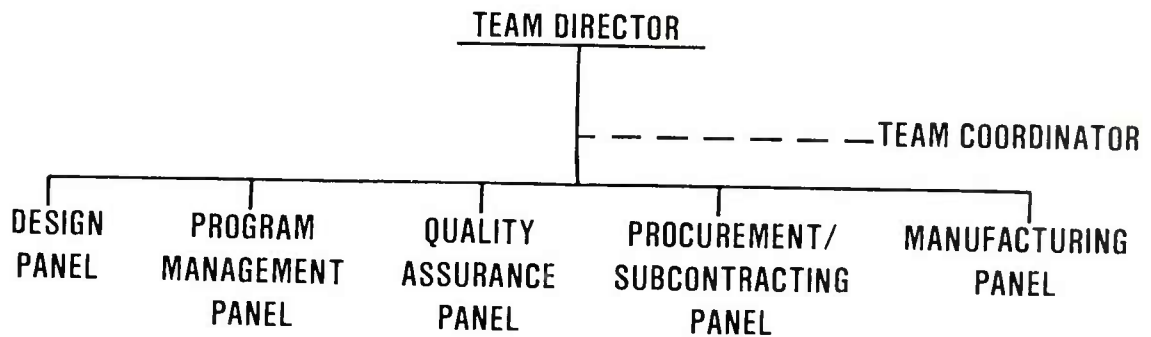
DATE  
PAGE OF

1. TOPIC		
2. THE PROBLEM		
3. SUGGESTED ACTION		
4. ACTION TO BE TAKEN		
5. ACTION	DUE DATE	COMPLETED



OUR TEAM - EVERYMAN AN ARMAMENTS EXPERT

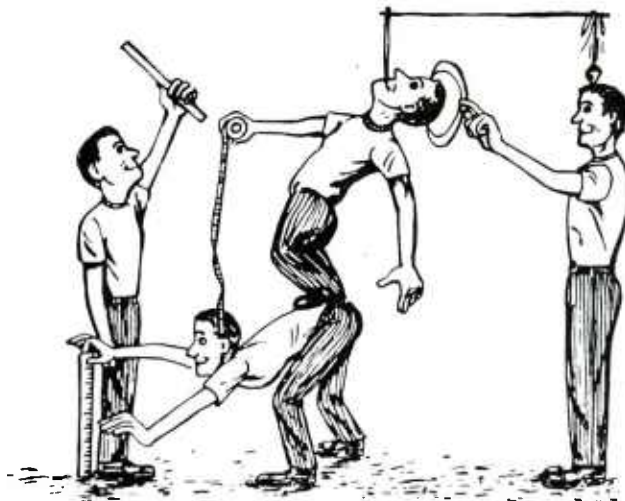
## THE PRR TEAM



NOTE: PANELS MAY BE AUGMENTED BY PERSONNEL FROM OTHER AGENCIES

## USE OF MANUFACTURING OPERATIONS CONSULTANT

● MR JACK R. FRANKS



## CONDUCT OF THE PRR

- PRIOR NOTIFICATION TO GOVERNMENT AGENCIES
- PRIOR NOTIFICATION TO THE CONTRACTOR
- INITIAL BRIEFINGS
- DAILY REVIEWS
- ROLE OF THE PRINCIPAL CONTRACTING OFFICER
- FINAL BRIEFINGS

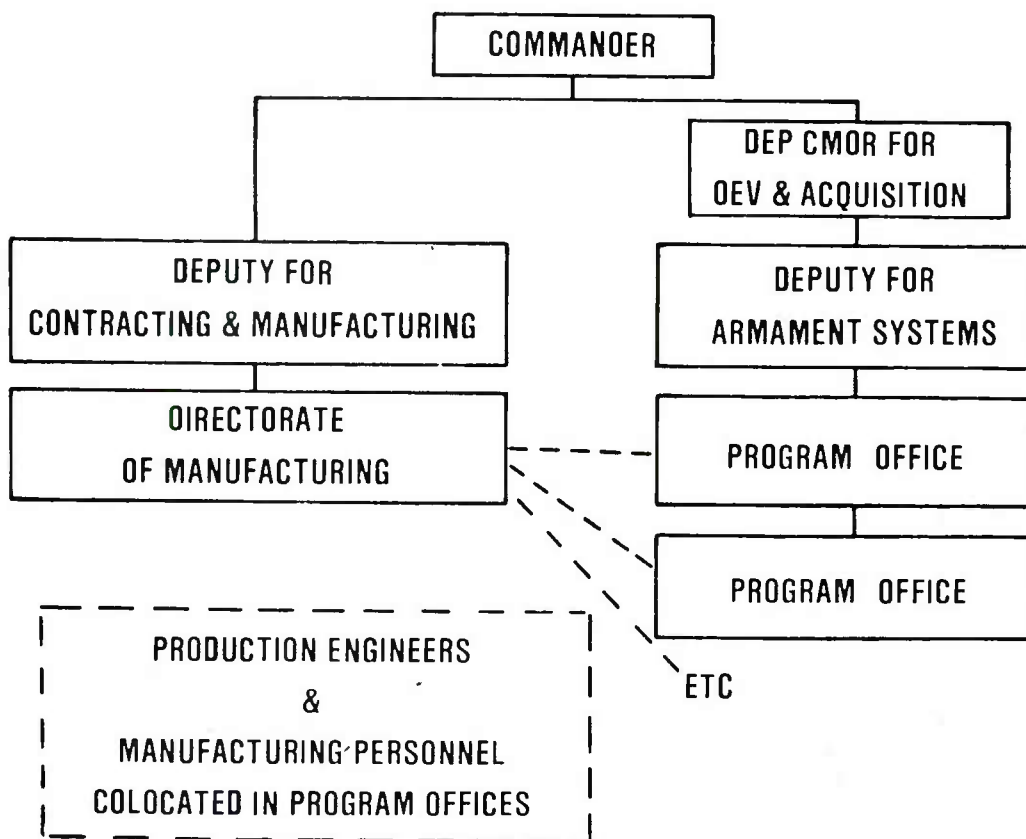
AD HAS RECEIVED  
OUTSTANDING SUPPORT  
FROM:  
AFCMD  
NAVY  
ARMY  
DEFENSE LOGISTICS AGENCY



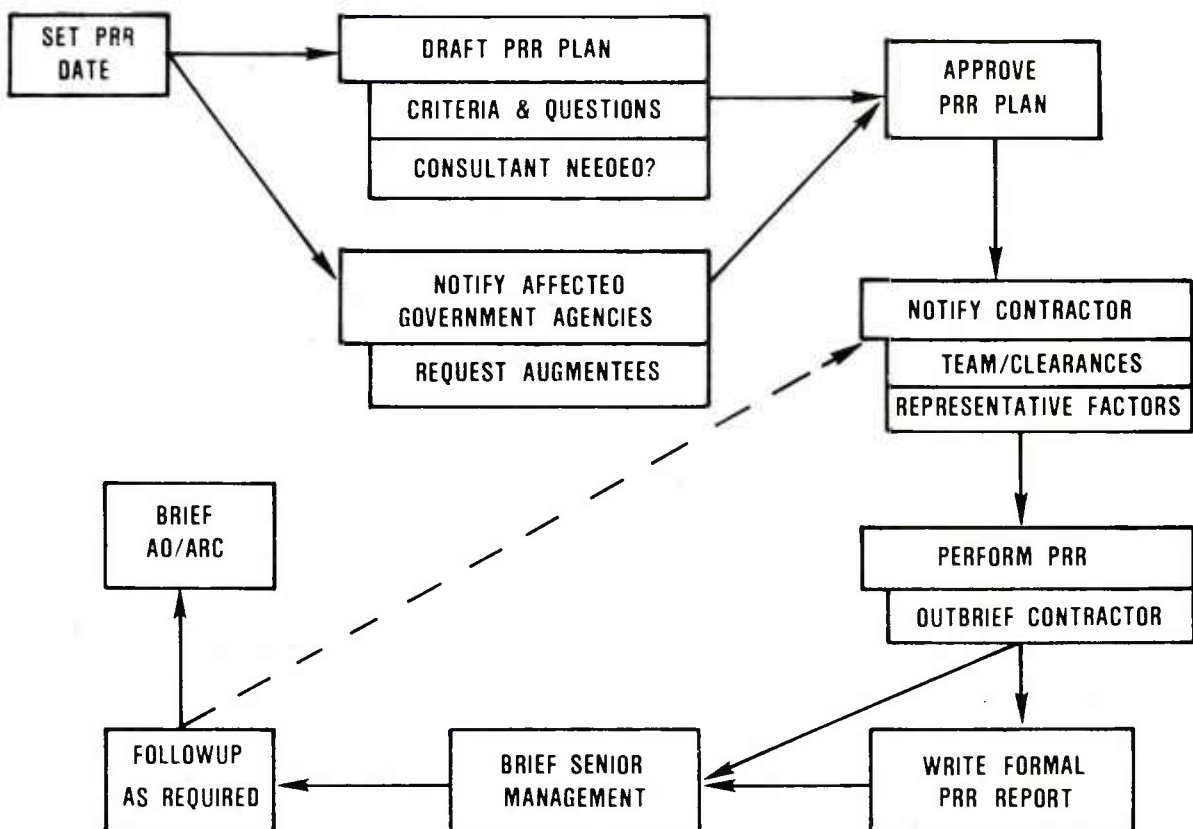
## REPORT AND BRIEFINGS

- FINAL PRR REPORT
- BRIEFING TO DEPUTY FOR CONTRACTING AND MANUFACTURING
- BRIEFING TO DEPUTY FOR ARMAMENT SYSTEMS
- FOLLOW-UP VISITS AND REPORTS
- BRIEFING TO AD ACQUISITION REVIEW COUNCIL

## ARMAMENT DIVISION ORGANIZATION



INDEPENDENTLY  
BRIEFING THE PRR  
PREVENTS  
THE SAME OLD  
REACTION  
AND DRAWS  
ATTENTION TO THE RESULTS!



## **SAMPLE PRR QUESTIONS**

- ARE ALL RELEVANT FUNCTIONAL DISCIPLINES ADEQUATELY REPRESENTED IN THE CONTRACTOR'S REVIEWING BODY FOR PROPOSED ENGINEERING CHANGES?
- HAVE DETAILED INSPECTION/TEST METHODS AND PROCEDURES BEEN PREPARED AND ACCEPTED BY THE LOCAL GOVERNMENT REPRESENTATIVE?

## **SAMPLE PRR QUESTIONS (CONT'D)**

- HAS DETAILED PLANNING BEEN ACCOMPLISHED TO PROVIDE FOR AN EFFECTIVE MANPOWER SUPPLY OF THE PROPER NUMBER AND SKILLS REQUIRED FOR PRODUCTION?
- ARE THE MASTER PRODUCTION SCHEDULES COMPLETE AND IN CONSONANCE WITH THE MASTER PROGRAM SCHEDULE?

SLIDES 1/2 - SHOCKED FACE/WHAT HAPPENS WHEN A CONTRACTOR FAILS?

- IN THE PAST THREE YEARS THERE HAVE BEEN TWO CONTRACTORS WHO FAILED TO PASS PRRS CONDUCTED BY AD PERSONNEL.
- I SERVED AS THE TEAM DIRECTOR FOR THE PRR I AM ABOUT TO BRIEF TO YOU.
- WE BELIEVE THIS PARTICULAR PRR IS A "CLASSIC" FAILURE ON A CONTRACTOR'S PART BECAUSE OF THE VARIETY OF DISCREPANT AREAS FOUND.

SLIDE 3 - FMU-112/B

- THE PROGRAM IS THE FMU-112 IMPACT SHORT DELAY FUZE.
- THE PRR WAS A CONTRACTUAL REQUIREMENT AND WAS CONDUCTED AT THE SCHEDULED END OF FULL SCALE DEVELOPMENT.

SLIDES 4 & 5 - PICTURES OF THE FUZE

- THESE TWO SLIDES ARE TO GIVE YOU AN IDEA OF THE CHARACTERISTICS OF THE FUZE WE WILL BE DISCUSSING.
- THE FMU-112 IS A POTTED ELECTRONIC FUZE. IT HAS AN AIR DRIVEN POWER SUPPLY, PART OF WHICH IS ALSO POTTED.
- THE FUZE MAY BE LOADED INTO EITHER THE NOSE OR TAIL OF A BOMB AND IS COMPATIBLE WITH REMOTE PROXIMITY SENSORS.
- THE FUZE CAN BE USED IN A HIGH OR LOW DRAG MODE. TWO ACCELEROMETERS ARE BUILT INTO THE FUZE TO SENSE DRAG. THESE ACCELEROMETERS ARE SMALL CONTAINERS WITH A STEEL BALL SITTING ON A CALIBRATED MAGNET. HIGH DRAG CONDITIONS PULL THE BALL OFF THE MAGNET AND AGAINST A SET OF ELECTRICAL CONTACTS. A CENTRIFUGE IS USED IN CALIBRATING THE MAGNETS TO A SPECIFIC BREAKAWAY FORCE FOR THE STEEL BALL.

SLIDE 6 - SUMMARY OF FINDINGS

- RETURNING NOW TO THE PRR, THIS NEXT SLIDE WILL GIVE THE SUMMARY OF FINDINGS OF THE INSPECTION.

- IT SHOULD BE NOTED THAT THE PRR WAS CONDUCTED IAW THE PROCEDURES I COVERED IN MY PREVIOUS BRIEFING.

● FIRST, SOME PERFORMANCE REQUIREMENTS WERE NOT MET AS OF SEPTEMBER 79. BECAUSE NOT ALL PROBLEM CORRECTIONS HAD BEEN TESTED AND THEIR SOLUTION DEMONSTRATED SATISFACTORILY, THEIR IMPACT ON PRODUCTION PLANNING WAS NOT ADEQUATELY KNOWN.

● SECOND, MANUFACTURING PLANNING WAS INCOMPLETE. THE APPARENT PREOCCUPATION OF PRGRAM MANAGEMENT WITH TECHNICAL PROBLEMS DURING THE DEVELOPMENT CONTRACT ALLOWED INADEQUATE PLANNING TO EXIST UNRESOLVED.

● THIRD, MANUFACTURING METHODS AND PROCESSES REQUIRED FURTHER DEVELOPMENT TO PREVENT IMPACTING LRIP PROGRAM COST AND SCHEDULE. THERE WERE TWO MAJOR PROBLEMS IN THIS AREA.

● AT THE TIME OF THE PRR, THE CONTRACTOR DID NOT HAVE A DEMONSTRATED METHOD FOR POTTING FUZES OTHER THAN USING SARAN MICROSPHERES, WHICH DOW CHEMICALS HAD DISCONTINUED MAKING.

● AT THE TIME OF THE PRR, PURCHASE OF TEN-STATION CENTRIFUGES TO CALIBRATE DROGUE ACCELEROMETERS FOR THE PRODUCTION EFFORT WAS PLANNED, BUT THE UNITS HAD NOT BEEN DEVELOPED OR DEMONSTRATED.

● FOURTH, THE CONTRACTOR'S MATERIAL MANAGEMENT SYSTEM DID NOT IDENTIFY AND EMPHASIZE CRITICAL MATERIALS OR PURCHASED ITEMS OF FOREIGN ORIGIN.

● FIFTH, COSTING METHODOLOGY WAS INADEQUATE AS THERE WAS NO SINGLE FOCAL POINT OF RESPONSIBILITY, AND THE CONTRACTOR HAD NOT DEVELOPED MANUFACTURING OVERHEAD AND G & A RATES FOR PRODUCTION.

● SIXTH, THE CONTRACTOR'S PURCHASING SYSTEM DID NOT ADEQUATELY MANAGE SUBCONTRACTORS (DELINQUENT AND UNACCEPTABLE DELIVERIES NOT SYSTEMATICALLY FOLLOWED-UP). THIS WAS A SERIOUS DEFICIENCY AS

THIS CONTRACTOR IS AN ASSEMBLY HOUSE WITH ALMOST TOTAL RELIANCE ON SUBCONTRACTORS FOR FABRICATION AND PARTS.

SLIDE 7 - CONCLUSION

AS A RESULT OF THESE FINDINGS IT WAS CONCLUDED THAT, AS OF SEPTEMBER 1979, THE CONTRACTOR WAS NOT READY FOR LRIP.

SLIDE 8/9 - CHRONOLOGY OF EVENTS/PERSONNEL'S REACTION

- NOW, LET'S LOOK AT TWO CHRONOLOGY OF EVENTS SLIDES AND SEE WHAT HAPPENED BETWEEN THE PRR IN SEPTEMBER 1979 AND THE AD/ACQUISITION REVIEW COUNCIL IN AUGUST 1980.

- SEPT 79--CONTRACTOR FOUND NOT READY FOR LRIP

COMPANY'S INITIAL RESPONSE TO THE PRR REPORT INADEQUATE, AND WAS REJECTED BY THE GOVERNMENT.

- JAN 80--COMPANY'S SECOND RESPONSE WAS ACCEPTABLE, WITH THREE AREAS OF CONCERN REMAINING:

- FIRST, THE CONTRACTOR'S WRITTEN RESPONSE TO THEIR PURCHASING SYSTEM INADEQUACIES WAS SATISFACTORY, BUT UNVERIFIED. THE PURCHASING SYSTEM WILL BE REVIEWED DURING PAS TO INSURE THAT THE STATED PROCEDURES ARE BEING FOLLOWED.

- SECOND, MANAGEMENT OF CRITICAL MATERIALS WILL BE DONE TO THE GOVERNMENT'S SATISFACTION BY INCLUDING A TAILORED CLAUSE FROM THE AFSC DAR SUPPLEMENT 7-150.4 IN THE LRIP CONTRACT.

- THIRD, THE REMAINING MANUFACTURING PROCESS CONCERN WAS DEVELOPMENT OF A NEW POTTING COMPOUND FORMULATION AND MECHANIZED POTTING CAPABILITY.

SLIDE 10/11 - BATTERING RAM/CHRONOLOGY (CONT'D)

- FEB 80--GOVERNMENT VISIT TO THE CONTRACTOR

COMPANY HAD NOT DONE ANY WORK ON NEW FORMULATION  
AFWAL-ML RECOMMENDED THEY DO SO  
AFWAL-ML WOULD DO AN INDEPENDENT FEASIBILITY STUDY OF  
CONTRACTOR'S PROPOSED APPROACH.

AFWAL-ML FIRST ATTEMPTS UNSUCCESSFUL

- MAY 80--AFWAL-ML FINISHED SECOND ATTEMPT AND ISSUED INITIAL FINDINGS: DISAGREED WITH CONTRACTOR'S SCHEDULE AS THEY FELT DEVELOPMENT OF NEW FORMULATION NOT A STRAIGHTFORWARD TASK.

AFWAL-ML FELT IT WOULD TAKE ALL OF A YEAR.

- 1 JUL 80--CONTRACTOR STARTED INDEPENDENT DEVELOPMENT OF A PRELIMINARY FORMULATION, USING THEIR OWN FUNDS.

- 16 JUL 80--CONTRACTOR COMES TO EGLIN TO DISCUSS:

- POTTING COMPOUND FORMULATION DEVELOPMENT: EFFORT EXPECTED TO BE COMPLETED BY THE THIRD WEEK IN AUGUST

- DEVELOPMENT OF A MECHANIZED POTTING CAPABILITY, COMPANY PRESENTED IN DETAIL HOW THEY WILL DEVELOP THIS CAPABILITY. PRODUCTION PERSONNEL AGREED WITH THEIR APPROACH.

- 8 AUG 80--AD/ACQUISITION REVIEW COUNCIL BRIEFED ON PROGRAM PRODUCTION STATUS.

## SLIDE 12 - CURRENT STATUS

- THE CURRENT STATUS (AS OF 8 AUGUST 1980) OF THE PRODUCTION ASPECTS OF THE FMU-112 PROGRAM WHICH WERE BRIEFED TO THE AD/ARC IS SHOWN BY THIS SLIDE. THE BOTTOM LINE IS THAT FROM A PRODUCTION STANDPOINT, THE CONTRACTOR WAS READY FOR LRIP.

- IN SUMMARY, WE CAN LEARN SEVERAL VALUABLE LESSONS FROM A PRR SUCH AS THIS ONE.

- FIRST, THE VALUE OF INCREMENTAL PRRS. THIS PARTICULAR PROGRAM DID NOT MAKE USE OF INCREMENTAL PRRS. AS WAS STATED EARLIER, THE APPARENT PREOCCUPATION OF PROGRAM MANAGEMENT WITH TECHNICAL PROBLEMS DURING THE DEVELOPMENT CONTRACT ALLOWED INADEQUATE PLANNING TO EXIST UNRESOLVED. AN INCREMENTAL PRR APPROACH COULD HAVE PREVENTED THIS, BY POINTING OUT DEFICIENT AREAS EARLIER.

- SECOND, THE VALUE OF WORKING THROUGH AN EVALUATION SUCH AS THIS ONE INDEPENDENTLY OF THE PROGRAM OFFICE. THE PRR TEAM HAD MEMBERS FROM THE PROGRAM OFFICE AND RESULTS WERE BRIEFED TO THE PROGRAM OFFICE, BUT THE PROGRAM OFFICE WAS NOT ALLOWED TO OVERRIDE THE TEAM DIRECTOR'S FINAL EVALUATION OR PREVENT IT FROM BEING BRIEFED TO SENIOR AD MANAGEMENT. THIS INITIALLY CAUSED A STRAINED ATMOSPHERE, BUT BY THE TIME OF THE AD/ARC THE PROGRAM OFFICE REALIZED THAT THE INITIAL FAILURE OF THE CONTRACTOR AND WORK DONE AFTERWARD ON HIS PROBLEMS ACTUALLY ENHANCED THE PROGRAM OFFICE POSITION BEFORE THE AD/ARC.

- AND FINALLY, THE VALUE OF MAINTAINING A FIRM BUT HELPFUL ATTITUDE TOWARD THE CONTRACTOR PAYED DIVIDENDS. THE CONTRACTOR HAD MIXED REACTIONS TO THE OUTCOME OF THE PRR. HIS FIRST RESPONSE TO THE DEFICIENCIES WAS NOT VERY POSITIVE. WHEN IT BECAME OBVIOUS TO HIM THAT THE GOVERNMENT CONSIDERED THE DEFICIENCIES SERIOUS AND WANTED CORRECTIVE ACTION BEFORE GOING ON, AND THAT WE WERE WILLING TO WORK THE PROBLEM WITH HIM, HIS ATTITUDE CHANGED. WE WORKED THE PROBLEMS TOGETHER.

SLIDE 13 - COUNTING FINGERS

I HAVE NOW COVERED ALL THE POINTS I WISHED TO MAKE. WE HAVE SEEN

HOW AD PREPARES FOR AND CONDUCTS PRRS. WE HAVE ALSO GONE THROUGH  
A SPECIFIC PRR WHICH A CONTRACTOR FAILED. THANK YOU VERY MUCH FOR  
YOUR TIME AND ATTENTION. ARE THERE ANY QUESTIONS?

# WHAT HAPPENS WHEN A CONTRACTOR FAILS A PRODUCTION READINESS REVIEW?

MAJOR STANLEY ZALACE  
DIRECTORATE OF MANUFACTURING  
DEPUTATE FOR CONTRACTING & MANUFACTURING  
ARMAMENT DIVISION

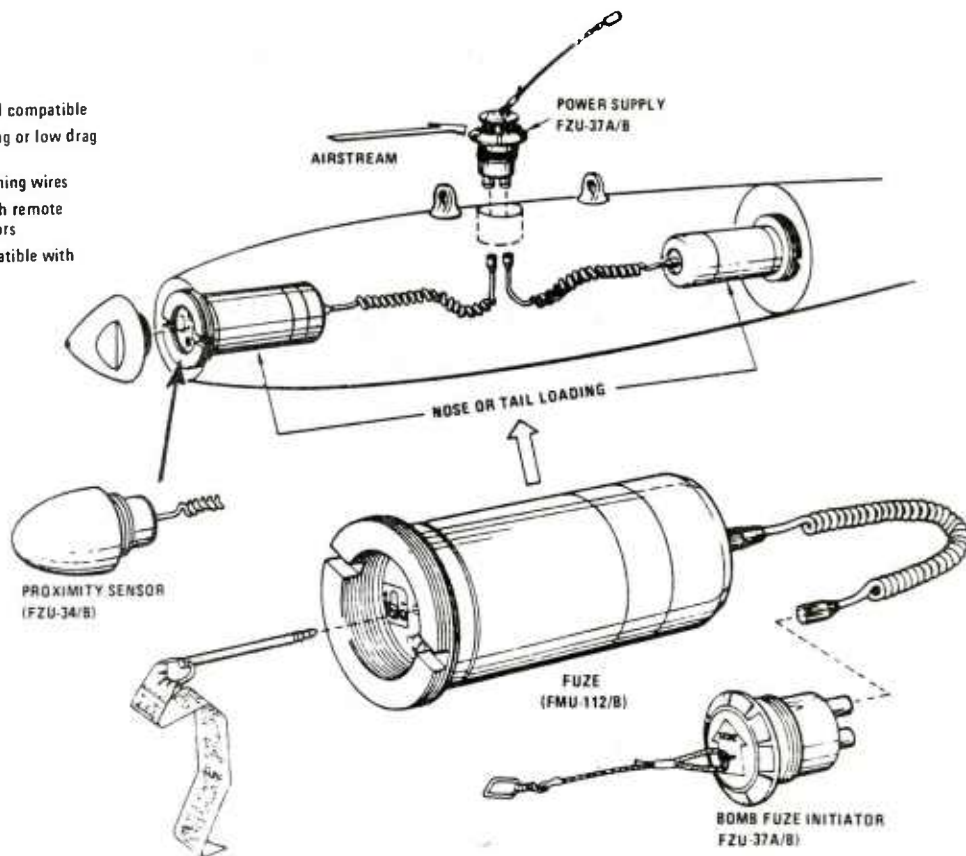


**FMU-112/B**  
**IMPACT SHORT DELAY FUZE**  
**PRODUCTION READINESS REVIEW**



## PRESENT FMU-112/B FUZE WEAPON SYSTEM

- Nose and/or tail compatible
- Use for high drag or low drag bomb releases
- No external arming wires
- Compatible with remote proximity sensors
- Circuitry compatible with Mk 43 TOD



## PRODUCTION READINESS REVIEW SUMMARY OF FINDINGS AS OF SEPTEMBER 1979

- SOME PERFORMANCE REQUIREMENTS NOT MET
- MANUFACTURING PLANNING INCOMPLETE
- MANUFACTURING METHODS & PROCESSES REQUIRED FURTHER DEVELOPMENT
- MATERIAL MANAGEMENT SYSTEM DID NOT IDENTIFY CRITICAL MATERIALS OR PURCHASED ITEMS OF FOREIGN ORIGIN
- COSTING METHODOLOGY INADEQUATE
- PURCHASING SYSTEM DID NOT ADEQUATELY MANAGE SUBCONTRACTORS

## PRODUCTION READINESS REVIEW

CONCLUSION: THAT AS OF SEP 79, THE CONTRACTOR WAS NOT READY TO ENTER LRIP OF THE FMU-112/B IMPACT SHORT DELAY FUZE AND THE FZU-37A/B BOMB FUZE INITIATOR



CONTRACTOR PERSONNEL HAD MIXED REACTION TO THE NEWS

## CHRONOLOGY OF EVENTS

24 - 26 SEP 79

PRR CONDUCTED AT PLANT. COMPANY FOUND  
NOT READY FOR LRIP

17 JAN 80

PRR FOLLOWUP REPORT ISSUED. CONTRACTOR  
CONDITIONALLY READY FOR LRIP

PURCHASING SYSTEM INADEQUATE

MATERIAL MANAGEMENT SYSTEM INADEQUATE

METHODS & PROCESSES REQUIRE  
FURTHER DEVELOPMENT

WE WERE WELCOMED BACK



## **CHRONOLOGY OF EVENTS (CONT'D)**

25 FEB 80	MATERIALS LABORATORY & PROGRAM OFFICE PERSONNEL VISIT CONTRACTOR
30 MAY 80	MATERIALS LABORATORY ISSUES INITIAL FINDINGS
1 JUL 80	CONTRACTOR STATED POTTING COMPOUND DEVELOPMENT
16 JUL 80	CONTRACTOR MEETS WITH FMU-112 TEAM
8 AUG 80	PRR STATUS BRIEFED TO AO/ACQUISITION REVIEW COUNCIL

## **PRODUCTION READINESS REVIEW CURRENT STATUS**

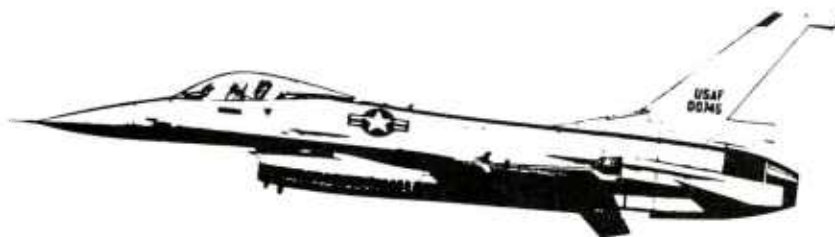
- MANUFACTURING PLANNING SATISFACTORY
- MFG METHODS & PROCESSES PROPOSED ARE LOW RISK
- MATERIAL MANAGEMENT SYSTEM APPEARS SATISFACTORY -  
TO BE VERIFIED DURING PAS
- COSTING METHODOLOGY SATISFACTORY
- PROCUREMENT SYSTEM APPEARS SATISFACTORY -  
TO BE VERIFIED DURING PAS
- CONTRACTOR IS NOW READY FOR LRIP

ANY QUESTIONS?





# F-16 ASSESSMENT OF MULTI-NATIONAL PRR's THE IMPACT OF TECHNOLOGY TRANSFER



LT COL THOMAS D. FIORINO  
DIRECTOR OF MANUFACTURING/QA  
DEPUTY FOR F-16

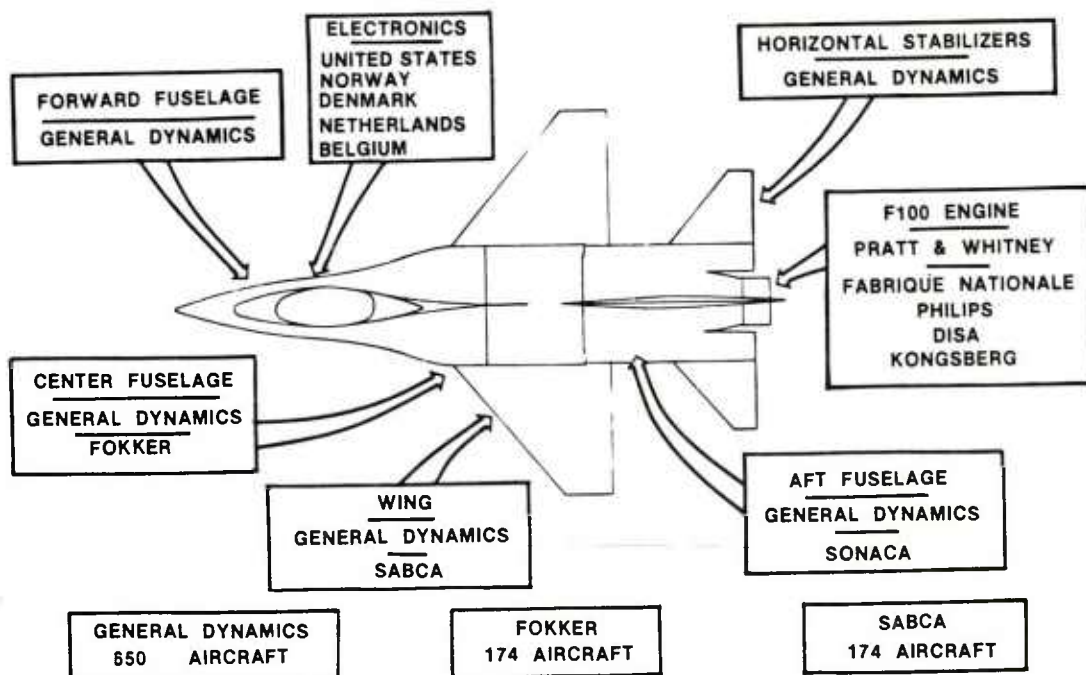
150L0

F-16 PROGRAM



## F-16 CO-PRODUCTION

MAJOR COMPONENT RESPONSIBILITY



## **MAJOR FEATURES**

- ALL DESIGN AND DEVELOPMENT IN U.S.
- NO ITEMS PRODUCED SOLELY IN EPCs
- TRANSFER TECHNOLOGY NECESSARY FOR CO-PRODUCTION
- EPG CO-PRODUCTION
  - 10% OF USAF 650 A/C PROGRAM
  - 40% OF EPG A/C
  - 15% OF OTHER F-16 SALES
- CO-PRODUCTION OFFSET GOALS
  - 58% OFFSET FOR 998 A/C
  - 80% OFFSET FOR 1500 A/C
  - 100% OFFSET IF OTHER SALES PERMIT



## **SELECTED SUBCONTRACTORS**

- REVIEWED LIST OF 113 SUBCONTRACTORS
- SELECTED 53 FOR GOVERNMENT SURVEY
- SURVEY RESULTS INDICATED REQUIREMENT FOR 23 ON-SITE SURVEYS
- SELECTION CRITERIA
  - NEW TECHNOLOGY
  - CRITICALITY
  - COMPLEXITY
  - DOLLAR VALUE
  - COPRODUCTION
  - TRACK RECORD



## **KEY POINTS OF SUBCONTRACTOR REVIEWS**

2017

- **CONTRACTOR DESCRIPTION**
  - HISTORY
  - SIZE
  - ORGANIZATION
  - PRODUCT MIX
  - EXPERIENCE FACTOR
  - LABOR RELATIONS
- **GENERAL CONTROL SYSTEMS**
  - PROPERTY CONTROL
  - QUALITY ASSURANCE
  - PRODUCTION CONTROL
  - PURCHASING
  - MAKE OR BUY
- **FULL SCALE DEVELOPMENT (FSD) PROGRAM STATUS**
  - SCHEDULES
  - DELIVERIES
  - TEST SUMMARY/PROJECTED COMPLETION
  - DESIGN STATUS/STABILITY
  - PROBLEM AREAS/CORRECTIVE ACTIONS

2117

## **KEY POINTS OF SUBCONTRACTOR REVIEWS (CONT'D)**

- **PRODUCTION PROGRAM PLANNING**
  - FACILITIES
  - MANPOWER
  - TOOLING/TEST EQUIPMENT
  - NON-STANDARD PARTS
  - CRITICAL/LONG LEAD ITEMS
  - SOLE/SINGLE SOURCE ITEMS
  - SIGNIFICANT DIFFERENCES FROM FSD
  - SCHEDULES
  - GFAE
  - REPAIR CAPABILITY
  - SUBSYSTEM INTEGRATION
  - PRODUCTION RATE CAPACITY
  - HIGH RISK AREAS
- **COPRODUCTION PLANNING**
  - EUROPEAN CONTRACTOR DESCRIPTION
  - COPRODUCED HARDWARE
  - DESCRIPTION OF COPRODUCTION TASKS
  - COPRODUCTION SCHEDULES
  - TRANSPORTATION/SHIPPING
  - U.S./EUROPEAN COPRODUCTION INTERFACE
  - CONTINGENCY PLANNING

F-16 PROGRAM



## COLOR CODE KEY



ATTABOY



SATISFACTORY

NEEDS IMPROVEMENT; ADDITIONAL  
MANAGEMENT ATTENTION REQUIREDSIGNIFICANT PROBLEMS; CONSIDERABLE  
MANAGEMENT ATTENTION REQUIRED

### FOKKER

190C9

COUNTRY: THE NETHERLANDS

U.S. CO-PRODUCER: GENERAL DYNAMICS

<u>PRODUCT</u>	<u>NEW PRODUCT LINE</u>	<u>NEW BLDGS</u>	<u>NEW EQUIP</u>
CENTER FUSELAGE		X	X
FLAPERONS			
LEADING EDGE FLAPS			
FUSELAGE MATE AND PRIMARY			
FINAL ASSEMBLY			
FIELD OPERATIONS			
<u>NEW TECHNOLOGY OR CAPABILITY</u>	<u>MEASURE OF TRANSFER</u>		
NC MACHINES (5)			
INTEGRAL FUEL TANK SEALING			
FIXTURES, TOOLING AND TEST EQUIPMENT			
QUALITY ASSURANCE			
CONTROLLED PAINT FACILITY			
MODULAR ASSEMBLY			



152L0

## EUROPEAN CO-PRODUCERS

	ORGANIZATION	MANAGEMENT	PRODUCTION CONTROL	QUALITY ASSURANCE	INVENTORY CONTROL	CONFIGURATION CONTROL	FACILITIES/EQUIPMENT	DOMESTIC INTERFACE	TRAINING PROGRAM	PRE-PRODUCTION PLANS	CONTINGENCY PLANNING
FOKKER	G	B	G	G	G	G	G	B	G	G	G
FAIREY	Y	Y	Y	G	G	Y	Y	B	Y	Y	Y
SABCA	G	B	G	G	G	G	Y	B	G	G	G
DAF	G	B	G	G	G	G	G	B	G	G	G
PER UDSEN	G	B	G	G	G	G	G	G	G	G	G



## GREEN LIGHT SUB-CONTRACTORS

9017

### U.S. AND CO-PRODUCTION

TELEDYNE  
LEAR-SIEGLER  
MENASCO

- AIR/GROUND IFF
- FLIGHT CONTROL COMPUTER
- LANDING GEAR

### U.S. ONLY

SPERRY RAND  
SYSTRON DONNER  
NORTHROP  
SIMMONDS-PRECISION  
SARGENT-FLETCHER  
GOODYEAR

- CENTRAL AIR DATA COMPUTER
- ACCELEROMETER
- RATE GYRO
- FUEL QUANTITY MEASURING SYSTEM
- FUEL TANKS
- WHEELS, BRAKES, ANTI-SKID

### COPRODUCERS

FOKKER  
MBLE  
STANDARD ELECTRIC

- CENTER FUSELAGE, AIRCRAFT ASSEMBLY
- RADAR COMPUTER
- ELECTRONIC COMPONENT ASSEMBLY
- FLIGHT CONTROL PANEL ASSEMBLY
- MANUAL TRIM PANEL
- AIR/GROUND IFF

STK



# KONGSBERG

244C9

COUNTRY: NORWAY

U.S. CO-PRODUCER: MARCONI-ELLIOTT/KEARFOTT

PRODUCT	NEW PRODUCT LINE	NEW BLOGS	NEW EQUIP
HEAD-UP DISPLAY	X	X	X
* ELECTRONIC UNIT			
STORES MANAGEMENT SET	X	X	X
RATE GYRO	X	X	X
INERTIAL NAVIGATION SET	X	X	X
NEW TECHNOLOGY OR CAPABILITY		MEASURE OF TRANSFER	
MIL-SPEC PRINTED CIRCUIT BOARD (PCB) SOLDERING/ASSEMBLY		MAXIMUM	
AUTOMATIC ELECTRONIC COMPONENT SOLDERING/ASSEMBLY/TESTING			
PRODUCTION CONTROL/CLEAN ROOMS			
CONFIGURATION MANAGEMENT			
GYRO CALIBRATION/ASSEMBLY/TEST PROCEDURES AND EQUIPMENT			
QUALITY ASSURANCE			
SYSTEM INTEGRATION TECHNIQUES			
COLD WALL MACHINING			
HEAT TREATING			
FLAT PACK FORMING AND CROPPING			
BURN-IN TEST PROCEDURES/EQUIPMENT			
REFLOW SOLDERING			
SPECIAL TOOLING/SPECIAL TEST EQUIPMENT			
PARYLENE CONFORMAL COATING			

153L0



## EUROPEAN CO-PRODUCERS

	ORGANIZATION	MANAGEMENT	PRODUCTION CONTROL	QUALITY ASSURANCE	MATERIAL CONTROL	CONFIGURATION CONTROL	FACILITIES/EQUIPMENT	DOMESTIC INTERFACE	TRAINING PROGRAM	PRE-PRODUCTION PLANS	CONTINGENCY PLANNING
SIMMONDS N.V. FUEL MEASURING SYSTEM	G	G	G	Y	G	Y	Y	G	G	G	G
NORCEM PLAST AMMO HANDLING	G	G	G	Y	G	Y	G	G	G	G	G
SPERRY VICKERS AMMO HANDLING	G	G	G	G	G	G	G	G	G	G	G
RAUFOSS AMMO HANDLING, WHEELS, CSD	G	G	G	Y	G	G	G	G	G	G	G
KONGSBERG 7 ITEMS	B	B	G	G	G	B	G	G	Y	G	G



## AREAS OF CONCERN

- EUROPEAN CO-PRODUCERS
  - ADDED LEAD TIME
    - SCHEDULING
    - CHANGE EFFECTIVITY
    - TRANSPORTATION
  - RESPONSE CAPABILITY
    - 1 SHIFT OPERATIONS
  - LIMITED ENGINE MAINTENANCE
  - FACTORY/AUTOMATIC TEST EQUIPMENT
  - QUALITY ASSURANCE
  - DIFFERENT MANAGEMENT CONCEPTS



## CONCLUSIONS

- MULTINATIONAL PRRs ESSENTIAL
- FOLLOW-UP IMPERATIVE
- STRENGTHENED INTERFACES
- CONTRIBUTED TO OFFSET MANAGEMENT



## SPACE DIVISION PRR EXPERIENCES

Much of what I have to say has been covered by the earlier speakers; however, I would like to address Space Division's experience with Production Readiness Reviews. I will also give some background on our programs and show how they are unique.

### CHART #2

Our satellite programs typically have a high unit cost. They are complex in that we are continually pushing the state-of-the-art on our payloads. We require very high reliability because once we we launch them, we can't get them back. Our current generation satellites have a 10 year design life and in order to get the reliability we need, we have a space qualified electronics piece parts class which are built to more stringent standards than Mil-Spec piece parts. Lastly, our programs are low volume; 15 would be considered a long run. Now I will talk about the Inertial Upper Stage which could be considered typical of our programs, then I will discuss the planning for the Global Positioning System, which is our first high volume program. One point I would like to make is that we don't usually go into the classical DSARC production decision process. Since we fly everything we buy, we are essentially committed during full scale development; therefore, we must be involved early.

### CHART #3

This is a breakdown of the IUS two-stage vehicle. It has kevlar wrapped motor cases with a 92" diameter first stage and a 63" second stage. It is an aluminum skin and stringer structure with redundant avionics to avoid single point failure modes.

The IUS is also used as an upper stage on the Titan III launch vehicle. The IUS can be converted from shuttle to Titan use if the need is identified early in the production flow.

#### CHART #5

This is our first PRR and three years ago this was the wording that was placed in the Statement of Work. Notice that there is no contractual flow down to subcontractors. However, the prime contractor and subcontractors were cooperative in conducting the PRRs.

#### CHART #6

This viewgraph illustrates the changes that have occurred in the program since we originally envisioned doing the PRR. You all have heard that the shuttle schedule has slipped, payload schedules have also slipped. Originally the shuttle was to launch ahead of Titan. The requirement for the Titan is because some payloads were not compatible with shuttle launch loads and therefore have to be launched on the Titan.

#### CHART #7

After a full scale development contract was awarded, we had determined that 22 critical design reviews were scheduled from Dec 78 to Jul 79. We naturally felt that all contracted components did require a PRR so we scoped the reviews to cover the larger of our critical subcontractors. Eleven components were viewed as critical to the program and we conducted eight incremental reviews to cover them. The prime contractor had the responsibility to conduct the PRR at the subcontractors, the Air Force participated as advisory team members.

#### CHART #8

When we did the Systems PRR at Boeing, we baselined the design at the DOD Two-Stage with the schedule presented here. One point I like to illustrate is that the FSD production rate is higher than the follow-on production, which points out the uniqueness of our programs.

#### CHART #9

Here is a summary of the reviews we conducted and some of the discrepancies noted. The details aren't important, however some action items were written against the prime or first subcontractor. Our early involvement pointed out in several instances that material had not been ordered in time to support the manufacturing schedule. Another concern was the high degree of schedule concurrency with the qualification model parts and flight vehicle parts.

This approach has some inherent risk but was required to maintain schedules.

#### CHART #10

Now I would like to talk about the Global Positioning System, which is one of our largest programs. The program consists of a space segment of 18 satellites in 3 orbital planes, a user segment which has equipment to be installed on aircraft, ships, vehicles, and a manpack; and the ground control system segment which consists of monitored stations, a master control station for satellite command and control, and an upload data link.

#### CHART #11

Here is a list of applications, but the basic mission is precise navigation on a worldwide scale.

#### CHART #12

This is a photograph of the different configurations to be found in the user equipment family. The total volume is somewhere between 20 and 30 thousand units, depending upon the equipment mix.

#### CHART #13

The program schedule depicted here will show you the relationship the three segments have to one another.

#### CHART #14

The factors that were considered in the PRR planning for the user equipment are: the size of the program which is the largest at Space Division; a three year full scale development contract which is a tri-service program with possible NATO participation; and two contractors in competition throughout the FSD phase. We have good visibility into the contractors operations and we did a Manufacturing Management/Production Capability Review prior to the awarding of the FSD contract.

#### CHART #15

The PRR Plan is the classical one in that we will do incremental reviews at the prime contractors as well as critical subcontractors. Through our early involvement we are emphasizing design and testing readiness as well as the producibility of the equipment. The review will be conducted using small teams to maintain personnel continuity relying heavily upon the joint program office resources.

#### CHART #16

We address much of the design criteria in conjunction with the scheduled design reviews as well as the parts, materials and processes control board. We also have a logistics interface which will be evaluated by the Logistics Directorate in the program office.

#### CHART #17

The PRR as written uses these criteria and other areas of concern.

#### CHART #18

The incremental reviews are structured to evaluate these areas which have a logical phasing to the program schedule. Software is also addressed in the design reviews. Criteria "G" addresses standardization.

Now, let's discuss the Space Segment and our initial planning for the PRR.

#### CHART #20

The spacecraft contractor has had some experience in that during the validation phase, which we are presently in, the contractor has built and launched six satellites for our test program. Schedule was also a determining factor in our planning since we anticipate a production contract award early in 1982. The program also has some funding restrictions which caused us some problems in scoping the incremental reviews.

#### CHART #21

We plan to do incremental reviews at the prime contractors as well as 10 critical subcontractors. The prime contractor has the responsibility to review the remainder of the subcontractors without the AF participation in the reviews. We will assess the criteria listed in DOD Instruction 5000.38.

#### CHART #22

We have found that early involvement in the PRR process is essential for program visibility and to provide management an early assessment of the program status. The evaluation criteria listed in AFSCR 84-2 has to be tailored to fit the unique environment of space systems. The contractual tasking of the prime should be as specific as possible and should also entail flow down to critical subcontractors. We also found that it is necessary to provide explicit tasking for the Contract Administration Office involvement and may entail pre-review meetings to insure a good understanding by the CAO and contractor as well. One point made earlier is that a coordinated agenda is essential for the conduct of the review. If you are reviewing a large contractor who has had PRRs in the past, it would be helpful to know how the contractors fared in those reviews. This approach would enable us to baseline

the contractor management system as well as identify areas of concern relevant to the program under review. The Contract Administration Office would be an excellent source for the management system baseline. Then the review team could evaluate the program peculiar requirements in-depth. Lastly, team continuity is essential in efficiently conducting the review. You don't have to get new team members up to speed on the PRR process.

Thank you for your attention.



### TYPICAL PROGRAM PROFILE

HIGH UNIT COST (\$25-\$45 MILLION)

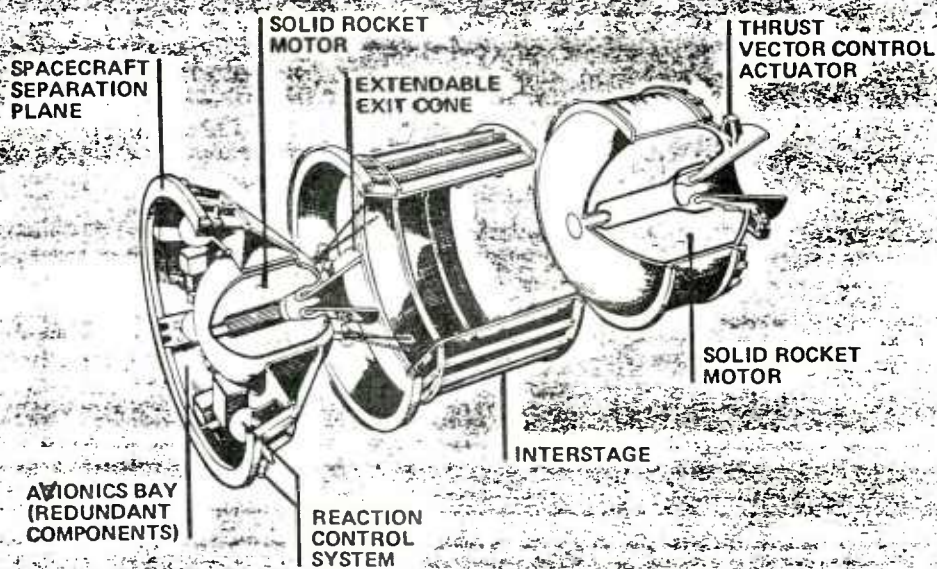
TECHNOLOGICALLY COMPLEX

HIGH RELIABILITY

LOW VOLUME

SD FORM 200  
JAN 80  
PREVIOUS EDITION IS OBSOLETE.

## IUS Two-Stage Vehicle



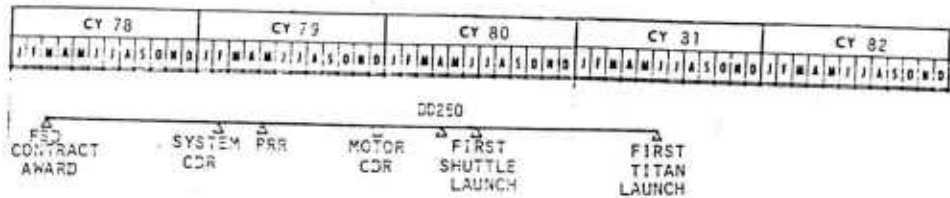


CONTRACT REQUIREMENT:

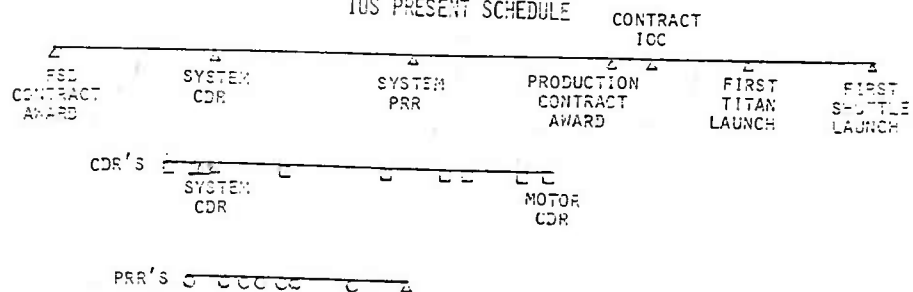
"PRODUCTION READINESS REVIEWS (PRR). A PRR SHALL BE ACCOMPLISHED 60 DAYS AFTER THE CRITICAL DESIGN REVIEW."



IUS CONTRACT SCHEDULE



IUS PRESENT SCHEDULE





### CRITICAL DESIGN REVIEWS

TWENTY-TWO SEPARATE CDR's SCHEDULED FROM  
DECEMBER 1978 TO JULY 1979

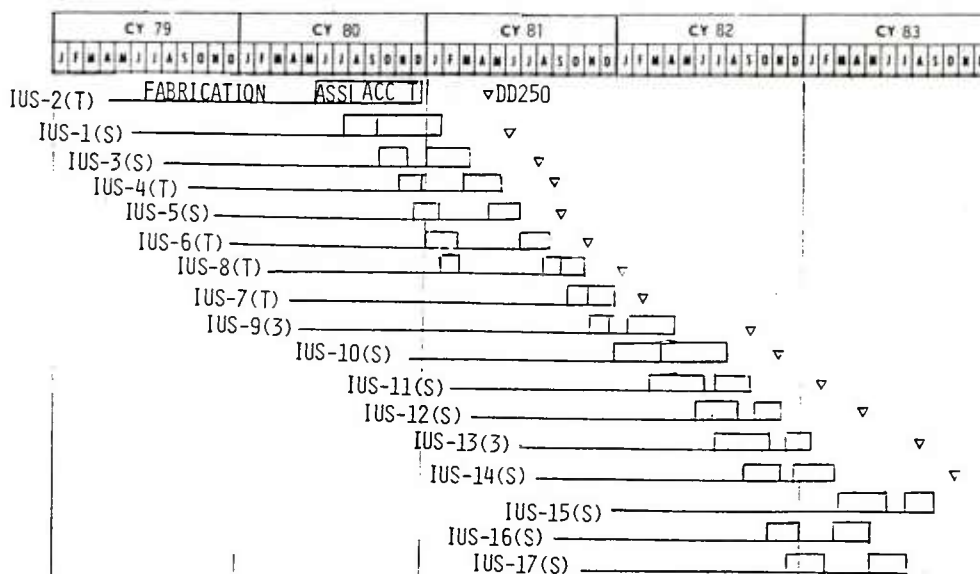
### INCREMENTAL PRR's

ELEVEN CRITICAL SUBCONTRACTED COMPONENTS  
EIGHT REVIEWS PLUS SYSTEM PRR  
JANUARY 1979 - MARCH 1980

SD FORM 200  
JAN 80  
PREVIOUS EDITION IS OBSOLETE.



### IUS PRODUCTION SCHEDULE



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JAN 80  
PREVIOUS EDITION IS OBSOLETE.

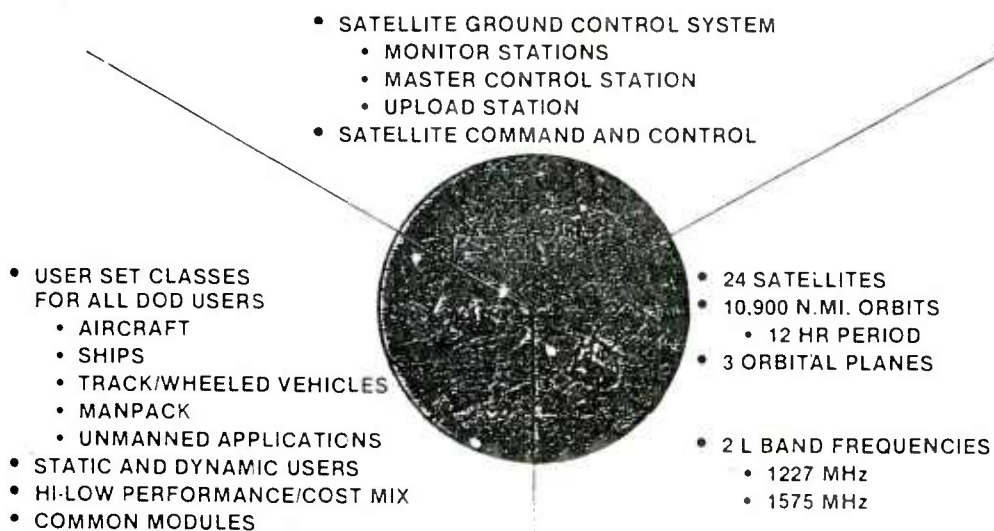


### INCREMENTAL PRRs

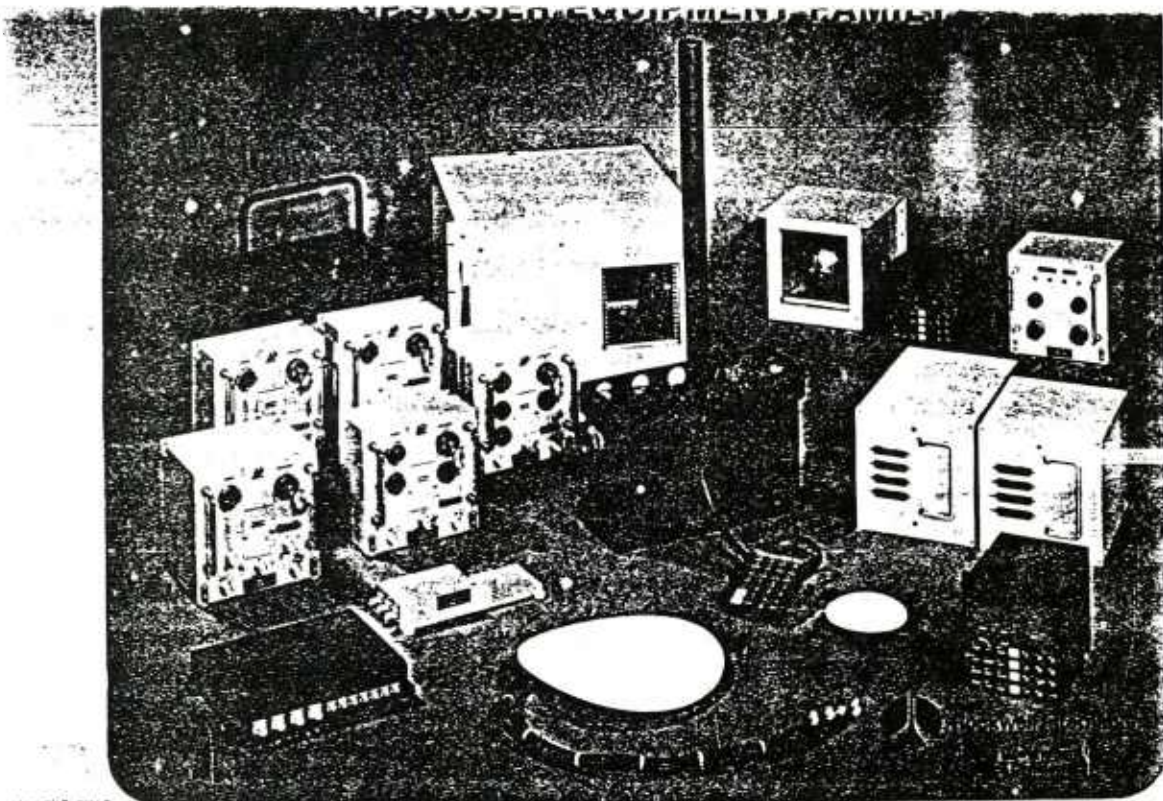
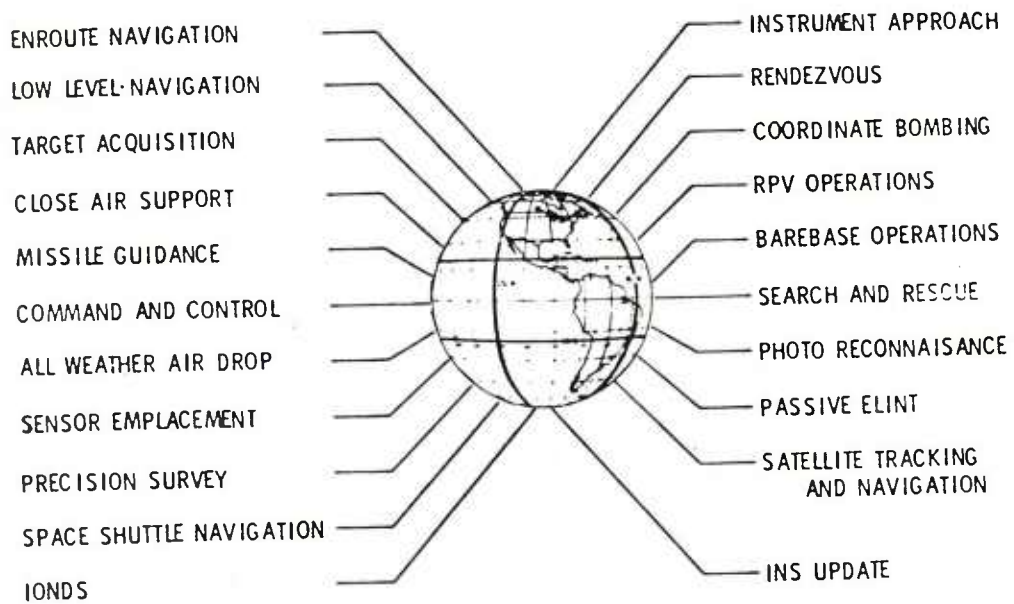
SYSTEM	CONTRACTOR	DATE	DISCREPANCIES	
			TOTAL	OPEN
COMPUTER	DELCO	MAR 79	16	
THRUSTVECTOR CONTROL	CSE	JUL 79	24	1
SOLID ROCKET MOTOR	CSE	JUL 79		
NOZZLE	KAISER AEROTECH	JUL 79	19	8
MOTOR CASE	BRUNSWICK	JUN 79	9	
ROCKET ENGINE MODULE	HAM-STD	APR 79	4	
RED. INERTIAL MEAS. UNIT	HAM-STD	JAN 79	13	
STAR SCANNER	BALL ASD	MAR 79	8	
DC-DC CONVERTERS	K-WEST	NOV 79	32	11
20 WATT AMPLIFIER	TRW	MAY 79		
SGLS TRANSPONDER	TRW	MAY 79	16	
SYSTEM PRR	BOEING	FEB 80	9	5

SD FORM 200  
JAN 80  
PREVIOUS EDITION IS OBSOLETE.

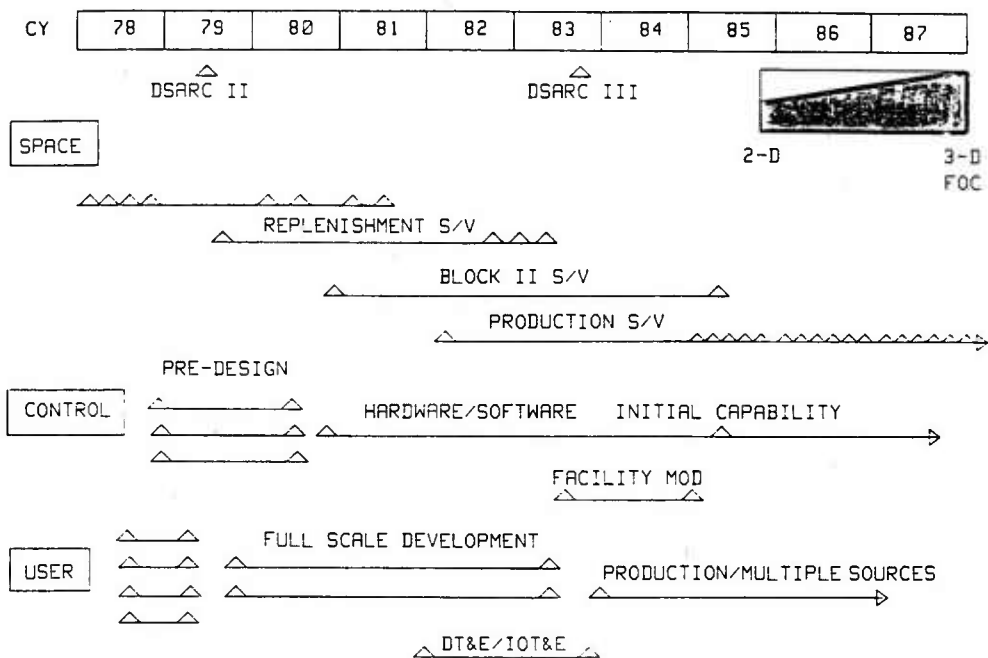
## WHAT IS GPS?



## GPS APPLICATIONS



לשטענדיג ווארטן און זיך



USER SEGMENT

## MAJOR SHAPING FACTORS

- PROGRAM SIZE
- SCHEDULE
- SPECIFICATIONS
- JOINT AGENCY PROGRAM
- CONTRACTORS



## USER SEGMENT

### APPROACH

- INCREMENTAL REVIEWS AT PRIMES
- CRITICAL SUBCONTRACTORS
- EMPHASIZE DESIGN, TESTING READINESS, PRODUCIBILITY
- USE SMALL TEAMS
- MAXIMIZE USE OF JPO RESOURCES

SD FORM 200  
JAN 80  
PREVIOUS EDITION IS OBSOLETE.



## USER SEGMENT

### MAXIMIZE USE OF JPO RESOURCES

- DESIGN REVIEWS
- PMPC BOARD
- LOGISTICS

SD FORM 200  
JAN 80  
PREVIOUS EDITION IS OBSOLETE.



#### USER SEGMENT

#### CRITERIA SELECTION

AFSCR 84-2 PARA 15

#### SUPPLEMENTED BY:

- WORK MEASUREMENT SYSTEM IMPLEMENTATION PLAN
- OSHA, ENVIRONMENTAL AND ENERGY CONSERVATION REQUIREMENTS
- THE LOGISTICS SUPPORT SYSTEM ADEQUACY
- SOFTWARE

SD FORM 200  
JAN 80  
PREVIOUS EDITION IS OBSOLETE.



#### USER SEGMENT

#### CRITERIA ASSESSMENT

- DESIGN REVIEWS  
ENGINEERING/PRODUCT DESIGN SOFTWARE
- PRR #1  
MANUFACTURING MANAGEMENT  
MATERIAL MANAGEMENT
- PRR #2  
FACILITIES  
TOOLING  
TESTING
- PRR #3  
EQUIPMENT  
ORGANIZATION
- PMPC BOARD  
CRITERION "G"
- LOGISTICS DIRECTORATE  
LOGISTICS CRITERION

SD FORM 200  
JAN 80  
PREVIOUS EDITION IS OBSOLETE.



## SPACE SEGMENT

### MAJOR SHAPING FACTORS

- CONTRACTOR EXPERIENCE
- SCHEDULE
- FUNDING



## SPACE SEGMENT

### APPROACH

- REVIEW AT PRIME
- REVIEWS AT CRITICAL SUBCONTRACTORS

### CRITERIA

DODI 5000.38





#### LESSONS LEARNED

- EARLY PRR INVOLVEMENT AND FOLLOW UP
- TAILOR AFSCR 84-2 CRITERIA FOR SPACE SYSTEMS
- CONTRACTUAL FLOWDOWN TO CRITICAL SUBCONTRACTORS
- EXPLICIT TASKING FOR CAO INVOLVEMENT
- FEEDBACK FROM OTHER PRR's
- TEAM CONTINUITY

AFCMD/AFPRO PRESENTATION  
DOD CONFERENCE  
PRODUCTION READINESS REVIEW

The AFPRO at the Hughes Aircraft Company has had extensive experience in Production Readiness Reviews (PRR).

### Chart 1

	AIR FORCE PLANT REPRESENTATIVE OFFICE DETACHMENT #36- HUGHES AIRCRAFT CO.	
	FY 80 PRR PARTICIPATION	



- INVOLVED IN 18 PRRS - 7 ARMY PROGRAMS - 3 NAVY - 3 AIR FORCE - 2 INCREMENTAL
- TOTAL MAN/HOURS EXPENDED IN SUPPORT: 2,488 RT MANUFACTURING OPERATIONS DIVISION  
   - 568 RT OTHER AFPRD DIVISIONS  
   3,040 M/HRS (2 ENGS, 2 WEEKS PER AVG PRR)
- ESTIMATED COST OF AFPRD PARTICIPATION: \$68,000 - \$3,778 AVG. PER PRR
- EXTENT OF AFPRD PARTICIPATION
- OBSERVATIONS

During the last fiscal year, we have participated in 18 PRR's. Seven (7) involved various Army programs, 3 were for the Navy and 3 for the Air Force. Two of the reviews were fragmented into 2 or more incremental visits. The total manpower expended by the AFPRO was 3,040 man/hours averaging about 2 engineers dedicated to the PRR team for two weeks. The cost of the AFPRO participation was \$68,000 - none of which was charged to the buying/program office.

The manner and extent of the AFPRO participation and the observations made as a result of this participation will be discussed later.

The next chart (Chart 2) identifies the various programs that were subjected to PRR's at Hughes. The F-18 and the U.S. Roland programs were accomplished by incremental review, of 2 or more visits. All others were undertaken as single visit PRR's from one to four weeks duration.

Chart 2



	AIR FORCE PLANT REPRESENTATIVE OFFICE DETACHMENT #36 - HUGHES AIRCRAFT CO.	
	PROGRAMS SUBJECTED TO PRRS	
<b>AIR FORCE</b>		
<ul style="list-style-type: none"> <li>● F-15 RADAR SUBSYSTEM (MACAIR/ASO) ● JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM (ESD)</li> <li>● DSU-21 TARGET DETECTORS (WRALC)</li> </ul>		
<b>ARMY</b>		
<ul style="list-style-type: none"> <li>● GROUND LASER DESIGNATOR SYSTEM (NIRADCOM) ● U.S. BOLAND FIRE CONTROL &amp; MISSILES (NIRADCOM)</li> <li>● XM-1 TANK FIRE CONTROL SYSTEM (TACOM) ● FIGHTING VEHICLE SYSTEM (TARADCOM) ● LASER TARGET DETECTOR (NIRADCOM) ● LIGHTWEIGHT LAUNCHER (NIRCOM) ● FIREFINDER (ERADCOM)</li> </ul>		
<b>NAVY</b>		
<ul style="list-style-type: none"> <li>● AS TARGET RECOGNITION ATTACH MULTISENSOR (NAVATR SYSCOM) ● DSU-15 TARGET DETECTOR (NAVATR)</li> <li>● F-15 RADAR SUBSYSTEM (MACAIR-NAVATR)</li> </ul>		

The manner and extent of the AFPRO participation in PRR's is promulgated in the AFPRO regulation 84-3, which implements the requirements of the Air Force AFSCR 84-2, and Chapter 6 of AFCMDR 84-1.

We have and will assist the buying/program office in the preliminary PRR actions, in on-site reviews and post PRR activities. The chart identifies these functions.

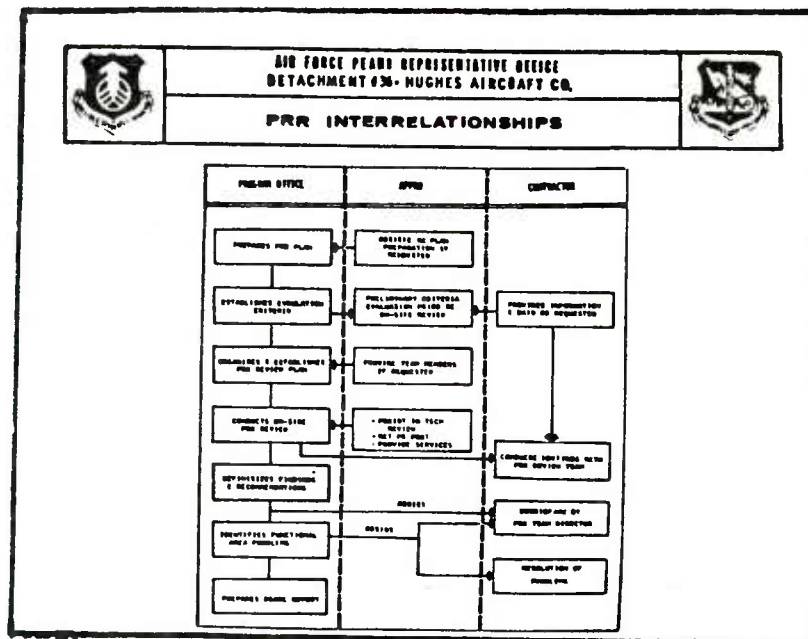
Chart 3

*Identifies areas that require special attention*

	AIR FORCE PLANT REPRESENTATIVE OFFICE DETACHMENT #36 - HUGHES AIRCRAFT CO.	
	EXTENT OF INVOLVEMENT	
<ul style="list-style-type: none"> <li>● ASSISTS IN PLANNING WHEN REQUESTED</li> <li>● MAKES-UP AND MAINTAINS MASTER PRR CRITERIA FILE - MAKES IT AVAILABLE TO PRR TEAM</li> <li>● PROVIDES TEAM MEMBERS IF REQUESTED</li> <li>● ACTS AS GOVERNMENT HOST ON-SITE - PROVIDES LIMITED SERVICES</li> <li>● ASSISTS IN DEFINITIZING FINDINGS &amp; RECOMMENDATIONS IF REQUESTED</li> <li>● ASSISTS IN DEBRIEFING IF REQUESTED</li> <li>● ASSISTS IN FOLLOWUP IF REQUESTED</li> </ul>		

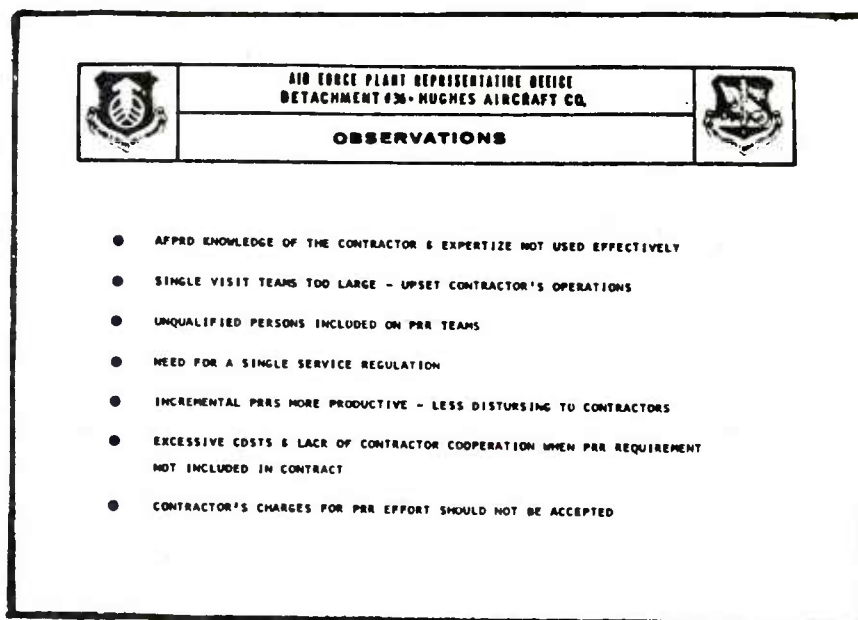
How these functions interrelate with the Program/Buying office is shown on this chart.

Chart 4



Our extensive experience and involvement resulted in some observations which I'd like to pass on to you for your consideration.

Chart 5



Some of the Buying/Program offices were unaware of an AFPRO's knowledge of the contractor's facilities, capabilities and operations. We were frequently asked to furnish evaluation manpower without much advance notice and only once were we asked to participate in pre-PRR action. On the F-18 review, the Navy requested us to review and comment on their PRR plan.

At this AFPRO we have developed and maintain a Master PRR File. It is current and reflects the contractor's production readiness in fifteen (15) functional areas and related factors.

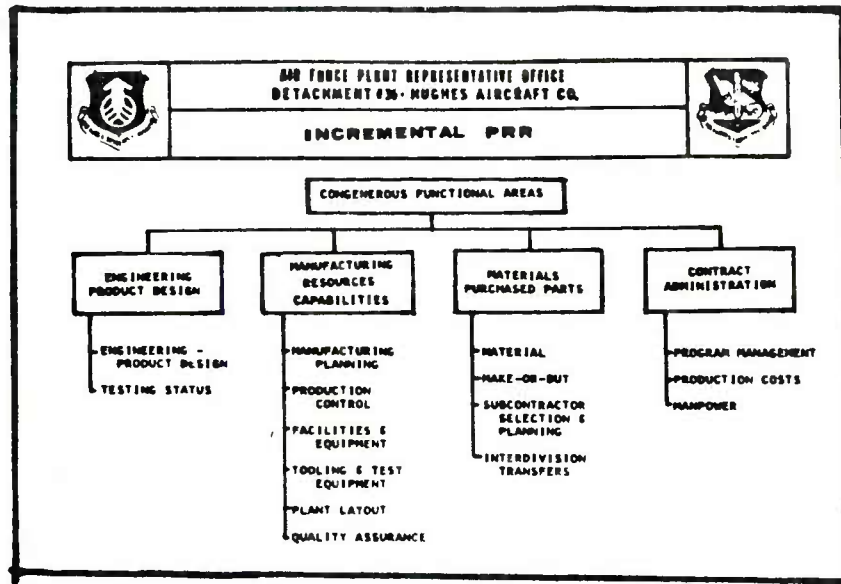
A contractor's condition of production readiness in each factor is determined by his compliance to criteria questions.

About 90% of the criteria questions are systems oriented and apply to all programs. Under our Master File concepts, this criteria has been previously evaluated and a PRR team need only to concentrate on those criteria (10%) which apply to a specific program. In the Make-or-Buy functional area, there are nineteen criteria questions, four of which apply to a specific program. For example, the question: "Does the contractor have a Make-or-Buy Program which is in compliance with the requirements of DAR 3-9000?" is applicable to all programs and the response is the same for every program. The question: "What percentage of the program is make and what percentage is buy?" applies to a specific program and should be considered by a Program PRR Team.

Contact with the AFPRO prior to an on-site review or excess to our Master File can reduce the evaluation effort considerable.

Large single visit teams containing as many as 60 persons have been upsetting to the contractor's operations. Last November the Army and Navy conducted two PRR's simultaneously with over 150 "visiting firemen" in the same plant. Incremental PRR's are more productive and less disturbing to the contractor.

Chart 6



Such a review could be fragmented into 4 congenerous functional areas and teams of 4 to 5 persons could evaluate these areas at different intervals of time. Another advantage that becomes apparent is that a review of the corrective actions required by a previous review could be made in a subsequent review.

AIR FORCE PLANT REPRESENTATIVE OFFICE DETACHMENT #36 - HUGHES AIRCRAFT CO.	
AFPRO SUGGESTIONS	
●	INCLUDE MIL-STD-1528 IN ENGINEERING DEVELOPEMENT AND/OR PRODUCTION CONTRACTS
●	INVOLVE AFPRO IN EARLY PRR PLANNING
●	INCLUDE AFPRO IN REVIEWS AS TEAM CHIEFS AND MEMBERS
●	USE INCREMENTAL RATHER THAN SINGLE PRR'S
●	USE AFPRO IN POST PRR ACTIONS
●	ACCEPT NO CHARGES FOR CONTRACTOR PRR ACTIVITY

*Imag. Park*  
*Det 36, PDD*  
*Nov 15, 1980*



**AIR FORCE PLANT REPRESENTATIVE OFFICE  
DETACHMENT #36 - HUGHES AIRCRAFT CO.**



MIL-STD-1528, PRODUCTION MANAGEMENT

**5.4**      Production Readiness Review.      (See Paragraph 3.5).  
This requirement is applicable to full-scale development phase contracts when the procuring activity advises that a Production Readiness Review is to be accomplished. The review will be scheduled and conducted by the procuring activity in accordance with AFSCM 84-3 and AFSCR 84-2 - which are referenced for information and guidance only. The contractor shall participate in planning for and accomplishment of the review and will provide necessary technical support and data required for review purposes. The contractor is not required to prepare any special data or reports for this review but shall make available information which is prepared and used within his production management system.

## PRR CONFERENCE CLOSING VIEWS AND CONTINUING ACTIONS

Truxtun R. Baldwin, Conference Chairman

The panel has nominated me to be their spokesman. So I'm going to speak for all, but I'm sure they'll jump in if there's something that I didn't cover. I'd like to go back to some of the questions and issues that I posed when we opened the conference yesterday. One of the questions was, "How do Services bring production management emphasis to bear earlier in the acquisition cycle?" I'm convinced after what we've gone through here in the last two days that we are doing this and that the PRR is a very useful vehicle and an authoritative vehicle for providing us the impetus to do so.

We had another question. "Are we spending the right amount on PRRs?" We gave you the range, both in absolute dollars and in percentage of development cost from Gary Dillard's paper. I haven't heard anyone suggest we are spending too much. We don't have any contractors here at this particular session to voice their opinion, but the conference as a whole has provided us with some insight on how we can make some economies in cutting down the number of visits, the size of the teams, better use of the contract administration office, its residents. We have many avenues pointed out to us where we can economize.

"Are we making PRR preparations and procedures easier for the contractor?" I think the avenue to that is more thorough planning and that's been a key recommendation of just about every speaker that we've had. We have recommendations to not require any additional data of the contractors, and we have such contract clauses included already in a number of cases, and again we're limiting the size of teams and the number of team members.

Another question was, "How can we improve the credibility of PRRs by quantifying our findings?" One of the continuing actions which I'll be going over shortly with you was that there's a consensus that DPESO should work more on these PRR indicators. They'll be needing more data to do this and we'll be requesting that of you, as you'll see shortly.

The final question was, "What new definitions or guidelines or other changes are necessary to DoD Instruction 5000.38 and how should they be transmitted to the DoD components?" We've discussed some new guidance, particularly in the area of software. I think something is in order there, and I would like to see the conference proceedings stand as the means of disseminating this. I think we would be ill-advised to rush in and try to change a document such as the Instruction every time we have a single change or addition that we need to make. Since the Instruction is general guidance in nature, we can let the proceedings handle that for us.

Overall, as I look at the conference, it's been very valuable and that's been by and large the main comment that I've gotten from everyone that I have talked to. It's very complimentary to the production community as a whole that we can hold a very orderly and a very good exchange of information and share our experiences with each other.

I'd like to give particular plaudits to the people that have administered this session; the Air Force, as you know, has been our very gracious host. We put them last on the agenda not because of any alphabetical or seniority order, but we thought you would insist as a gracious host that you do come last. We are very much indebted to you for holding this and Lt. Goodale has seen for our every need. He's been able to anticipate everything that

would be needed. It's one of the most efficient jobs that I have seen of putting on a conference, from the PA system to every furnishing and almost every creature comfort that we could hope for. On our DPESO side Lee Schumacher, as you know, has honchoed that aspect of the thing, and Mary Hart is back there as his right-hand person. I particularly want to thank my panel members who have given me such able assistance. Everyone who has administered this conference is owed a debt of gratitude. It's been very efficiently done and we've gotten maximum mileage out of our time here because of it.

I'd like to depart from the agenda now. Instead of going into an open discussion, I'd like to go through some of the continuing action items that I have identified and worked up overnight to put before you. I have about a dozen or so of them and what I would like to do is go through this list. I'll present an observation as to what I saw as a key item from my minutes, and then I'll propose a continuing action. In a couple of cases you'll see I have no action put down, because although I wanted to recognize the discussion that took place, I thought the consensus was that we should not follow through and take some action. So let me start up at the top. These are only in the order that my minutes reflect.

#### Observation #1

Defense Systems Management College's (DSMC) Program Management Course does not contain material on planning, organizing, and conducting PRRs.

#### Action #1

OSD (AP) MSA will provide course and lecture material for DSMC use. Note: DSMC has contracted for the preparation of a Program Manager's Guide for Production Management which will have a section on PRRs (see appendix B).

#### Observation #2

Credibility of PRR findings and support for PRR conclusions and recommendations would be improved by more quantitative data.

#### Action #2

DPESO will continue its work in development of baseline indicators from normalized data having statistical significance.

#### Observation #3

DPESO work on PRR baseline indicators is preliminary in nature due to small amount of data available.

#### Action #3

DPESO will prepare a request for sharing existing data to be included in PRR Conference Proceedings for response by conferees. Service PESOs will assist in collection of data. (Note: See page 295 of these proceedings.)

#### Observation #4

Integral or embedded software associated with operation and support of the system is growing in magnitude, complexity, cost and impact on program readiness for production but is not given specific treatment in DoD Instruction 5000.38, Appendix A "Production Readiness Guidelines."

#### Action #4

DPESO will prepare appropriate wording for a new item A 9 under Product Design for dissemination with the conference proceedings. (Note: See page 297 of these proceedings.)

#### Observation #5

More advance notice and schedule coordination is required between DPESO and the sponsoring Service on DPESO attendance and participation in Service-conducted PRRs.

#### Action #5

DPESO will meet with the Service PESOs to advise which of their programs are identified as major systems by OSD, and to set preliminary PRR schedule and tentative DPESO participation.

#### Observation #6

There is no DoD PRR plan equivalent to the Army AVRADCOM document.

#### Continuing Action #6

None - such a document would be cumbersome considering the wide differences in products, acquisition concepts and approaches to PRRs held by the services. Individual commands and activities within the services are encouraged to formalize their PRR planning process as they deem beneficial.

#### Observation #7

The Services vary in their selection of a PRR team leader ("director and focal point") between a member of the PM office and an independent activity. DoD Instruction 5000.38, paragraph F I does not so distinguish.

#### Action #7

None - such selection responsibility is delegated to the DoD component. Objectivity is served as a consequence of the wide ranging technical expertise, Service PESO and DPESO participation and the independent production readiness assessment prepared for the DSARC Chairman.

#### Observation #8

Experiences gained in conducting PRRs to date would be beneficial to others holding PRRs in the future.

#### Action #8

DPESO in conjunction with Service PESOs will glean major "lessons learned" from presentation material and discussions, list by "PRR Conference Subject Areas" and distribute with conference proceedings. (Note: See page 297 of these proceedings.)

#### Observation #9

Government plant activities can be of still greater assistance to PRR teams in conducting PRRs if ample notification and assistance desired are communicated.

#### Action #9

Service PESOs in planning and scheduling PRRs for their Service will assure that the cognizant plant activities for prime, sub, and GFE contractors are advised of the schedule and scope of PRRs.

#### Observation #10

The DoD PRR Conference was most worthwhile and should be held annually.

#### Action #10

Navy PESO will take into consideration hosting a meeting next year which will follow-up on this year's conference and possibly embrace a second topic, e.g., "Production Engineering and Planning." Contractor participation would also be considered.

Observation #11

OSD/DPESO Production Readiness Assessments (PRAs) are reviewed with the applicable PM offices but not necessarily with other participating elements.

Action #11

Subsequent to issuance of the Secretary of Defense Decision Memoranda, DPESO will provide a signed copy of the PRA to the PM and to the Service PESO of the cognizant Service.

Observation #12

Cost investigations could be better used to identify potential production problems and resulting schedule and cost risk.

Action #12

DPESO and Service PESO participation in PRRs will exercise Design-to-Unit-Production-Cost and 5000.38 criterion A-7 to advantage during PRRs to identify troublesome areas and components.

Observation #13

Cost reduction is a major concern of the PRR. Plans and provisions for cost reduction during production are to be presented to the DSARC at Milestone III (per DoD Directive 5000.34).

Action #13

DPESO will critique the system's cost reduction program in preparing the Production Readiness Assessment.

Observation #14

The Production Management community needs a PRR data bank to include lessons learned and contractor assessments.

Action #14

Army PESO in conjunction with DPESO and other Service PESO's will take this item under study to include the possibility of establishing Army Management Engineering Training Activity training program.

## SHARING OF PRODUCTION READINESS REVIEW DATA

The DoD Product Engineering Services Office (DPESO) is conducting studies to quantify various measures of production readiness. (Refer to "Baseline Indicators of Production Readiness" and "Production Readiness of Computer Software," pages 25 and 31 in these proceedings.) The output of the studies will include statistical distributions depicting how values of selected readiness indicators vary as a function of program maturity. Discussions during the Production Readiness Review (PRR) Conference indicated that these distributions would be of value in making objective determinations of production readiness.

Further progress in developing these distributions would be greatly expedited if more quantitative data were made available during the study effort. Accordingly, contributions of appropriate data are solicited from all individuals involved in PRRs. Submission of this data is exempt from the review and approval provisions of DoD Directive 5000.19, Enclosure 3 because it constitutes voluntary sharing of information obtained and evaluated in the normal course of the PRR process.

Although contributions of data relating to any quantifiable indicators of production readiness will be welcomed, there is immediate need for data in the following categories:

● For Hardware:

- Engineering change activity (with an indication of the number of drawings which comprise the total drawing package)
- Reliability growth
- Yield rates for manufacturing processes
- Yield rates for test operations
- Scrap and rework rates
- Out-of-station work

● For Software:

- Extent of total computer memory utilized
- Extent of total computer processing time utilized
- Software error discovery rate
- Software-related change activity (if possible, separate changes to specifications from changes needed to correct baselined software)
- Mean time between computer program errors (during formal testing)

There is no need for the data to be provided through formal channels, nor in a particular format. Long term trend data is preferred in lieu of point values. Please identify the data by including the following:

- Name or nomenclature of the product and/or process
- Corresponding significant events or phases in the life cycle of the program or product (i.e., prototype build period, development engineering testing, operational testing, software-hardware integration, production release, etc.)

Please include the name, organization, and telephone number of the individual submitting the data to facilitate any needed clarification of the data, as well as to permit sharing of interim findings of the studies.

The Resource Management and Analysis Division of DPESO will serve as the focal point for receipt of the data as well as answering questions pertaining to the data collection. Questions relating to hardware data should be directed to Mr. Jack Bemis; on software data, to Mr. Lee Schumacher. Both can be reached on 703-756-2335, or Autovon 289-2335. Data should be sent to:

Mr. Jack Bemis  
DPESO-XC  
c/o DLA, Cameron Station  
Alexandria, VA 22314

Please help us assure widespread participation so that the results will be meaningful to the PRR process. Thank you.

## PRR LESSONS LEARNED

### ● Contractual Coverage

- Obtaining contractor participation in and support of the PRR requires contractual coverage.
- This requirement should be spelled out in a Statement of Work (SOW) and placed in the ED contract. (PRRs will be conducted during this phase - prior to Milestone III.)
- The SOW should preclude any new data being generated - use existing records, reports, management data, etc. as evidence to validate claims of readiness.
- Define extent of coverage expected and extent of government participation, i.e., 'N' visits of 'X' personnel for 'Y' days.
- Define who will conduct PRRs at subcontractors (prime contractor lead with government observing or government lead with prime contractor observing. Spell out in SOW).
- Include guidance regarding which subcontractors will be visited and number of visits.

### ● Planning

- An effective planning effort starts prior to commencement of the ED phase.
- Begin by forming a planning group.
- Determine contractor selection criteria (those contractors to be reviewed) based upon program size, complexity, time and manpower available, criticality, new technology involved, and contractor's past performance.
- Develop PRR team organization and determine types and quantities of personnel required for the team.
- Identify, select, and train personnel forming the PRR team.
  - Go where necessary and use all available influence to get high quality members on the team. Don't settle for second best.
  - Use of outside consultants adds prestige and credibility to PRR.
  - Make maximum use of personnel from outside the PMO.
  - Assign members to specific panels; designate panel leaders.
  - Maintain maximum possible continuity of team membership.
- Determine number of PRR visits to each contractor and subcontractor (function of program complexity or problems anticipated). Incremental PRRs have proven more productive than one-shot reviews.
- Establish schedule for reviews; coordinate with all parties concerned as soon as schedule is constructed in order to facilitate overall scheduling and minimize number of visits. Coordination should include:

Contractor; Program Office; Service PESO, DPESO, and cognizant Contract Administration Office (CAO).
- Prepare team Work Packages (line of questioning to be followed and specific questions to be asked).

- Assign an individual to be responsible for administrative matters (travel reservations, rental cars, lodging, security clearances, and funding).
- Incorporate some flexibility to accommodate situation changes.
- Orientation/Familiarization
  - The PRR team members (and the contractors visited) should be instructed that the success of the PRR process is measured by their ability to improve the transition from development to production and correct what may be wrong or omitted in a timely manner.
  - PRR Team
    - Brief PRR team members on background and history of program.
    - Discuss PRR objectives, modus operandi, and schedule.
    - Discuss availability of relevant data, reports, studies, and contractor's track records.
    - Discuss responsibilities of each principal contractor involved in the program.
    - Review Work Packages and modify as necessary.
    - Arrange for CAO briefing, covering contractor's past history, current experience in this program, other concurrent in-house government and commercial contracts.
    - Valuable insight into the readiness of the system under review can be obtained from examining the contractor's experience/problems in producing a similar product(s).
    - Evaluation of the readiness of a system for production cannot be made in isolation from other contracts and activities; the contractor's entire business base must be taken into consideration when weighing facilities, manpower, and financial matters.
  - Contractors
    - Hold Pre-PRR briefing with contractor.
    - Explain objectives of PRR.
      - Discuss PRR team composition.
      - Determine members and types of contractor personnel required for interface with PRR team.
    - Discuss types of data, reports, and records readily available from contractor.
      - Review proposed questions, agenda, and schedule.
    - Determine extent of prime contractors' involvement in review of subcontractors.
- On-Site Procedures
  - Start the PRR with a brief "government only" meeting which includes:

- CAO briefing covering contractor's capabilities and problem areas, and the CAO's assessment of the program status.
  - Restatement of modus operandi and administrative matters.
- Receive a briefing from the contractor which summarizes program status in areas to be covered by PRR panels.
  - Introduce all personnel, government and contractor, to be involved in the PRR (identify respective roles in PRR).
  - Do not let contractor under review dictate the course of the PRR.
  - Keep formal briefings to a minimum.
  - Maximize time available for panels to meet with contractor personnel and for discussion of specific areas of responsibility.
  - Concentrate on collecting sufficient relevant information and data to support firm conclusions.
  - The PRR team leader should be sure he makes use of all his expertise; consultants, laboratory personnel, cost analysts, etc.
  - Time can be saved by providing the contractor(s) with a list of questions and reviewing the answers prior to visits.
  - Make maximum use of existing data; do not require new data to be generated, or old data to be reconfigured.
  - Do not mix other program management business with conduct of the PRR.
  - Set aside a period each day for meeting of government participants to highlight and discuss current findings, exchange information between PRR panels and convey to appropriate panels any investigative leads detected by another panel.
  - Treat skills, expertise and corporate memory of on-site CAO personnel as valuable resources.
  - Use questions in Work Packages as guides for line of questioning to be followed, not as a script.
  - Hold exit briefing at conclusion of each PRR visit. Areas of concern or unsatisfactory findings should be presented to the contractor, who should be made aware that corrective action on his part is expected. Positive findings should also be noted in the exit briefing.
  - Top management of both the PMO and contractor should be encouraged to attend the exit briefing.
- Areas of Investigation During PRRs. This listing augments the PRR criteria or "Production Readiness Guidelines" contained in enclosure 1 to DoDI 5000.38.
    - A. Product Design
      - 9. The software for the integral or embedded computer subsystem has reached a state of development and test compatible with the entire system and does not constitute risk to either meeting the program schedule or causing extensive design changes to system hardware, as evidenced by:
        - a. Low and stable level of change activity.
        - b. Acceptability of configuration documentation.
        - c. Acceptability of programming language.
        - d. Availability of reserve memory capacity.
        - e. Satisfaction of computation time requirements.

- D. Materials and Purchased Parts
  - 8. Where appropriate the Defense Priorities System is being exercised to reduce lead times and insure meeting schedules.
- G. Contract Administration
  - 2. There exist established procedures for processing engineering change proposals and control of government furnished property.

## ● Cost

- System Cost
  - PRRs must pay more attention to the cost factor in assessing the readiness of the system for production. Cost has become the principal issue at DSARC III on most programs. Many PRR teams have found it profitable to include a cost analyst.
  - Cost issues which PRRs should address include:
    - Has the contractor identified high-cost items and processes? Is he working to develop alternate, lower cost items and processes? Has this effort been verified, and is the effort effective?
    - Who are the critical high-cost suppliers and subcontractors? What is being done to reduce costs in these areas?
    - Does the contractor have an active Value Engineering (VE) organization? Is it adequately staffed with well-trained personnel? Where is this group on the organizational chart? Is there documented evidence of their success on prior programs in the company?
    - Does the contractor have a Design-to-Unit-Production-Cost (DTUPC) goal? Where does he stand in relation to the goal? What steps are being taken to meet or better the goal? Are the current DTUPC projections adequately supported? (Review the data and rationale used to arrive at these projections).
    - Does the contractor demonstrate a sincere interest in reducing costs, or is he just paying "lip service" to the overall philosophy?
    - Does the contractor solicit adequate competition for purchased items?
- PRR Execution (In-House and Contractor)
  - The PRR should be concerned with minimizing the costs entailed with the PRR itself and Government PRR costs.
    - PRR team size should only be as large as needed to do the job. Too many team members adds costs and reduces efficiency of other members.
    - Hold duration of reviews to the minimum necessary to obtain needed data.
    - Utilize available services of resident CAO personnel.
    - Schedule PRRs by geographical areas to avoid multiple cross-country trips.

- Contractor costs in support of the PRR.
  - Make use of existing data and resources. Do not ask for special reports or data to be generated.
  - Encourage the contractor to make available only those personnel directly concerned with areas being reviewed. Discourage large numbers of contractor personnel being in attendance when they are not directly involved in, or contributing to, the review process.
  - Do not direct the contractor to take any action which could be construed as a constructive change and a cost increase to the contract.

● PRR Follow-Up

- Identify problem areas and areas of concern in PRR Report.
- Document findings in sufficient depth.
- Pursue action items generated during PRR to ensure resolution prior to the DSARC.
- PRR report should identify all areas of risk and areas which are unsatisfactory. Realistic assessments of risk areas should be made, identifying potential program impacts.
- Corrective actions taken by contractor should be monitored to determine effects of these actions.
- CAO personnel may be used to monitor contractor's corrective actions and report on same to PMO.
- Continuous follow-up activity is necessary to keep pressure on those responsible for corrective action.



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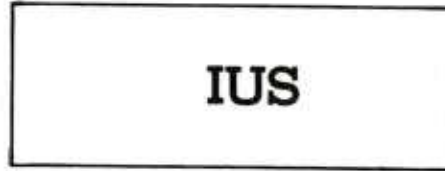
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## MANUFACTURING READINESS FOR PRODUCTION

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Manufacturing readiness for production starts early in the design phase of a program with the integration of design and production producibility analysis activities. Increased emphasis is being placed by the Government on production management early involvement in the product acquisition cycle. The customer today is demanding special attention to decrease production costs *prior to* as well as *during* production. To meet this objective a planned, explicit, and timely assessment of the production management implications and production risks are necessary. This assessment covers the program from the beginning of the acquisition cycle through the decision to go into production.

There are a number of required guidelines for both the customer and the contractor. One of the foremost involving manufacturing is MIL-STD-1528, "Production Management," describing the Air Force requirements for an effective production management system. This MIL-STD was written to be applied in total, or tailored to, the specific requirements of each contract based on program technical complexity, production risk, production cost, scope of production operations, and potential for program impact due to production operations. Implementation of MIL-STD-1528 typically requires documentation (a formal production plan) and the conduct of formal production readiness reviews prior to transition from full scale development to production. The following discussion is drawn from my Boeing manufacturing operations experience with several programs, but particularly from IUS.

The success of IUS or any product is established during the design phase of a program. For example, during the IUS concept (validation) phase, Boeing designed the upper stage vehicle, developed and tested certain high risk hardware, and conducted many major tradeoff producibility analyses. Manufacturing's key role during this early phase involved fabrication and assembly of developmental test hardware, initiation of a producibility program for design analysis and supportive trade studies on alternate design concepts. It also involved participation in subcontractor source selection surveys, preparation of preliminary make/buy plans, and preparation of a preliminary production plan.

Certainly a key activity to the development of a good production plan is the determination and optimization of the product's pro-

ducibility. Producibility considerations during preliminary planning include economic evaluation of alternative configurations.

These alternatives could be any, all, or a combination of materials, methods, processes, technology, tooling, test equipment and procedures, sequence of processes, factory layout and flow, lot size, cyclic demand, packaging and handling, inspection, manual versus computer part processing, and capability and capacity versus outside source development. These considerations also include review of drawings, specifications, test procedures, and tool and production planning. The review is essential to verify that all necessary information is included for the craftsmen in the factory to fabricate, assemble, install, and test parts and assemblies within program requirements. This activity requires a coordinated effort between the designer and manufacturing engineer responsible for a hardware package. There is a continuing relationship from concept through final determination of a production configuration. They are supported, as necessary, by Materiel, Manufacturing Technology, Industrial Engineering, Quality Assurance, and Factory organizations to assure that all elements affecting a cost effective, reliable end product are identified and incorporated.

While producibility analysis is a significant activity in reducing production risk, it is not always a precise science. It is more of an art, where perseverance and just plain hardnosed experience are the key to success. To explain what I mean, let me relate the PDU chassis story. The power distribution unit (PDU), one of the IUS electrical power distribution system electronic boxes, was design-specified as a welded chassis assembly constructed of many 6061 aluminum detail parts. Producibility analysis of the PDU chassis resulted in the following:

- Reduction in part count by 32 (44-12)
- Reduction in manufacturing flow time by 48 mandays (90-48)
- Reduction in linear inches of weld by 375 inches (many multiple passes)
- Weld repair drastically reduced through use of 2219 aluminum material
- Heat treat eliminated (age only)
- Weld engineer surveillance virtually eliminated
- Factory labor manhours per unit were significantly reduced
- Product quality and appearance were greatly enhanced

This story illustrates the point that craftsmanship in the factory must be backed up with craftsmanship in design, producibility analysis, and production planning to achieve optimum end product results.

Not all of the hardware in any system is made by the prime contractor. Attention must also be paid to the subcontractors and their producibility analyses and documentation. Engineering, Manufacturing, and Quality Assurance provide technical support to the subcontractors in their producibility evaluations.

As noted earlier, one of the Government initiatives promulgated through MIL-STD-1528 is the requirement for formal production plans. Documentation portrays "Methods and concepts for employing facilities, tooling, and manpower resources of the contractor and subcontractors. It reflects all time-phased production actions required to produce, test, inspect, and deliver acceptable contractual end items on schedule at minimum cost."

The production plan usually is comprised of the following sections:

- I Manufacturing Organization
- II Make or Buy
- III Subcontracting
- IV Resources and Manufacturing Capability
- V Production Planning

Detail requirements for each section of the production plan can be found in Government Data Item Description DI-P-3460. The significance of the production plan is that it provides a detailed "road map" from drawing to completed hardware. It incorporates the results of producibility analysis and trade studies. It is submitted to, and approved by, the Government and updated during various program phases. Properly done, a production plan is the Manufacturing person's bible.

Using the production plan as a baseline, you can verify that your homework has been done and your planning is complete. This allows the contractor and the Government to conduct indepth reviews. As an example, I will describe how Boeing and Space Division/NASA conducted reviews of IUS readiness for production.

DOD Instruction 5000.28 describes the objective of a production readiness review (PRR) as follows:

"To verify that production design, planning, and associated preparations for a system have progressed to the point where a production commitment can be made without incurring unacceptable risks of breaching thresholds of schedule, performance, cost, or other established criteria."

The criteria for conduct of PRRs are provided in AFSCP84-2 and overall production management evaluation approach is documented in AFSCP84-3. These instructions deal with functions that are highly specialized and subject to differing interpretations, definitions, and understandings. Many program/functional groups in Government/contractor organizations are impacted. Misunderstanding of interpretations and requirements can be avoided by very early joint participation by contractor and the Government in developing a production readiness review plan.

The Boeing/Government team who conducted 11 PRRs at subcontractors supplying mission critical hardware to IUS were, for the most part, the same team that conducted the Boeing PRR. During the subcontract PRRs, Boeing conducted the review with Government team members acting as advisors. During the Boeing

PRR, the roles were reversed with Government team members conducting the review and Boeing team members providing the information. This is an effective way of developing an integrated industry/Government team early in the program. It provides a mutual understanding of system elements, functions, and interfaces and leads to an efficient and economical system-level review.

I believe I can offer a few "Lessons Learned" which may help in demonstrating manufacturing readiness for production.

#### Do:

- Understand what PRRs are all about and the significance the customer places on them.
- Posture yourself early enough to be ready.
- Review and prepare
  - Agenda
  - PRR criteria and ground rules
  - Program's themes/messages
  - A single thread story
  - Understand all other elements, functions, and interfaces
- Reflect a single program team approach.
- Use the production plan as baseline for the PRR.
- Be responsive to the customer and understand his requirements at all times.
- Prompt a response-oriented session where the customer will discuss his concerns.
- Balance showmanship with substance.

#### Don't:

- Surprise the customer in a PRR.
- Forget to be prepared to address problems encountered during developmental phases and do show how they were solved before production.
- Indicate everything is peaches and cream; risks do exist; therefore,
  - Identify risks
  - Show good abatement plans, and
  - Show that risks are controlled.
- Forget to follow up on questions, comments, or last PRR issues.
- Be caught on MIL-STDs (1695, 1520A, 1567, 1528, etc.).
- Develop a proposal one way and really plan to do it differently.
- Try to con the customer; they are as smart as you are and have probably been through this more than you.
- Hipshoot answers—get back with specific details.
- Give impromptu demonstrations; if a demonstration is worth giving, it is worth preparing for.
- Don't try to answer questions outside your area of expertise.
- Find out who is best qualified and refer the questioner to them. If you can't help, then *be helpful*.

In summary, three recommendations are offered:

- The Contractor/Government must mutually define the manufacturing readiness criteria early in the program.
- Utilize resident Government agencies (AFPRO, DCAS, NASA) in the planning and conduct of production readiness reviews at both the prime contractor plant and subcontractor plants.
- Contractor/Government must both do your homework; know the production plan, and the design and specification requirements before reviews are conducted.

## PROGRAM MANAGERS GUIDE

FOR

## PRODUCTION MANAGEMENT

One of the major recommendations of the PRR conference was to develop mechanisms for the dissemination of lessons learned on PRR's. One potentially effective vehicle to meet some of this need is the upcoming Program Managers Guide for Production Management. This document is being developed at the request of the Joint Logistics Commanders through a contract issued by the Defense Systems Management College to Analytics.

Part of the effort under this contract is to identify the current practices of the DoD in production management and the lesson learned in applying production management techniques to DoD programs. The planned use of the Guide is as a desk reference to be issued to Program Management offices to aid in the management of acquisition programs. The first draft of the contents of the Guide is attached. Your assistance in providing support to the development of this guide is requested. If you have any comments, suggestions as to coverage or documentation which would contribute to a more effective document, please contact:

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## APPENDIX A

Suggested topics for inclusion in the Program Manager's Guide for Production Management:

### Chapter

1. PRODUCTION MANAGEMENT OVERVIEW. The industrial base and its relationship to a program. Overall production concept. Demand and capacity. Long and short term operational and investment decisions of the contractor. How to determine program production requirements and evaluate contractor capabilities. Criteria for determining efficiency and effectiveness of a production management system. Current issues: productivity; energy; OSHA requirements; environment; standardization; inflation, profits.
2. PRODUCTION PREPAREDNESS. Industry vs. government objectives. Corporate planning and business environment. Labor skill levels and their availability. Cost-volume-profit relationships. Contracting, subcontracting, make-or-buy strategies and controls. Competition at the contractor and subcontractor levels. Second-sourcing decisions.
3. PROGRAM MANAGEMENT RESPONSIBILITIES. Responsibilities of the Service program manager relative to production management. Selection of personnel. Responsibilities of the industry program manager relative to production management. Nature of problems at the Government/industry interface and how to cope with them. Managing contracts when a second-source is involved. Government financing and management of multiple sources of production critical components. Managing when NATO countries are involved in co-production programs.
4. PREPARATION FOR PRODUCTION. Product development. Production plan. Concurrency. Technical risks. Work-breakdown structure and charting techniques. Manufacturing technology. Introduction of new processes. Purchasing plan. Quality assurance plan. Maintenance plan. Resource requirements: labor, capital, and facilities.
5. PRODUCTION CAPACITY. Planning facilities for production: plant location, plant design, plant layout. Contractor incentives to build/modernize facilities. Termination buyback techniques. Contractor vs. Government-furnished facilities and services. Rewarding contractors for investments in cost-reducing production facilities. Idle facility and idle capacity costs.

6. PRODUCTION MANAGEMENT TOOLS. Information systems to support decision-making. Computer-aided: management, design, manufacturing, inspection, and testing. Applications. Limitations. Benefits. Industrial robots. Adaptive and non-adaptive production control systems.

7. PRODUCTION CONTROLS. Production planning, scheduling, and control. Budgetary and cost control. Performance measurement and control. Inspection. Quality Assurance. Contractor material review board actions. Test. Production reviews. Inventory control. Logistic support.

8. PRODUCTIVITY IMPROVEMENT. Productivity methods, standards and measurement. Motivation and training of personnel. Learning curves. Capital investment: tooling, equipment, facilities. Industrial engineering. Value engineering.

9. PROGRAM CONTROLS AND DOCUMENTATION RELATING TO PRODUCTION. Contracting provisions and incentives. Reporting systems and documentation. Production management controls, including line-of-balance and production reviews. Contractor indirect costs. Financial management. Configuration management.

10. TRANSFER OF PROGRAM MANAGEMENT RESPONSIBILITIES. Policies, criteria and procedures for transferring program management responsibilities from a development to a readiness command. Problems and solutions.

11. CASE STUDIES IN PRODUCTION MANAGEMENT. Army, Navy, and Air Force case studies, including lessons learned in various facets of production management.